THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LIII. No. 1346.] LONDON, FEBRUARY 26, 1889. [41ST YEAR. Price 6d.

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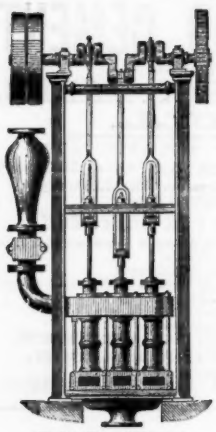

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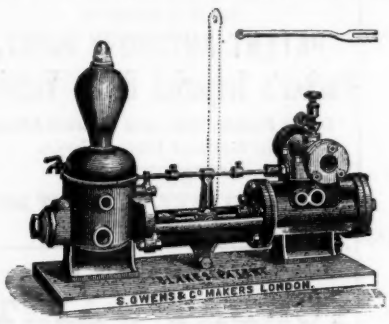

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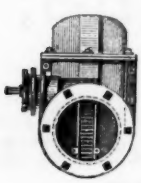

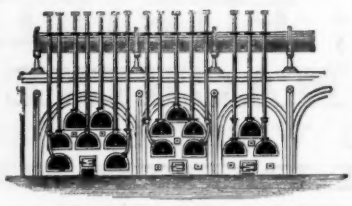

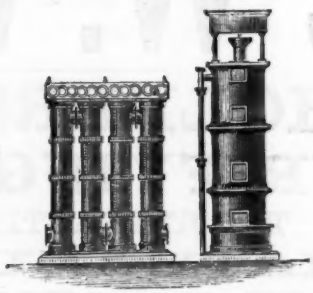

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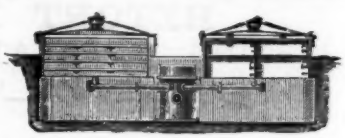

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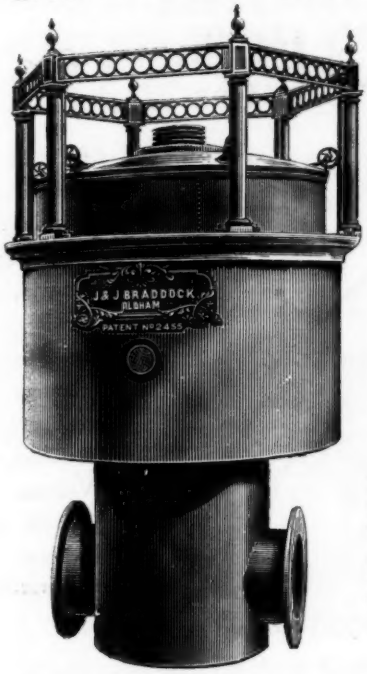

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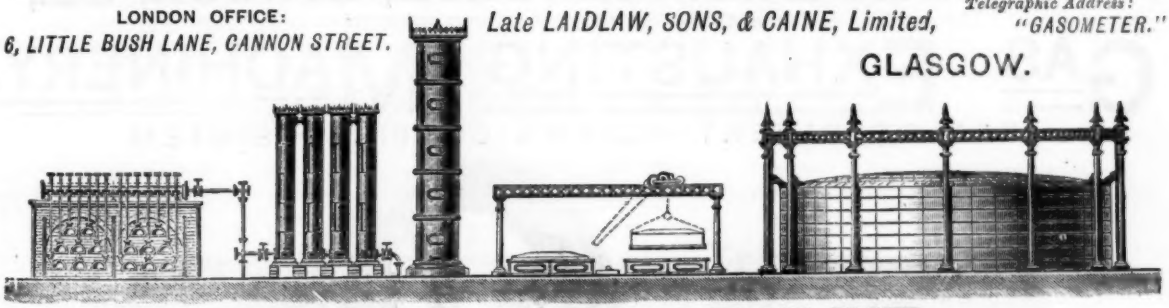

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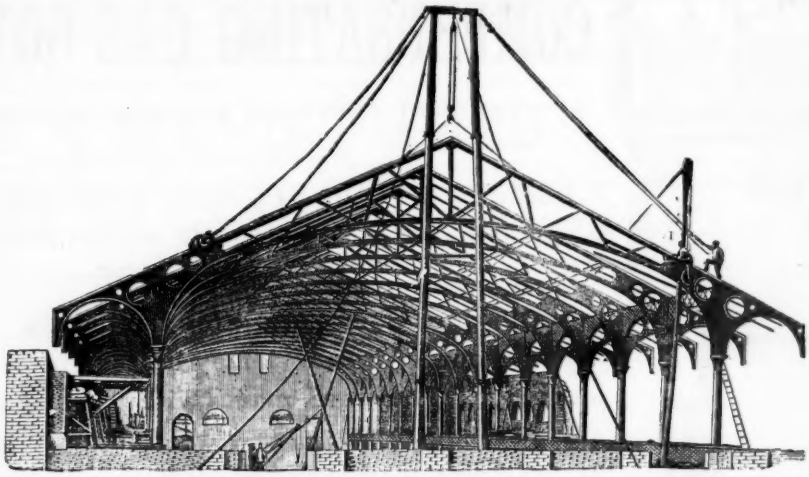

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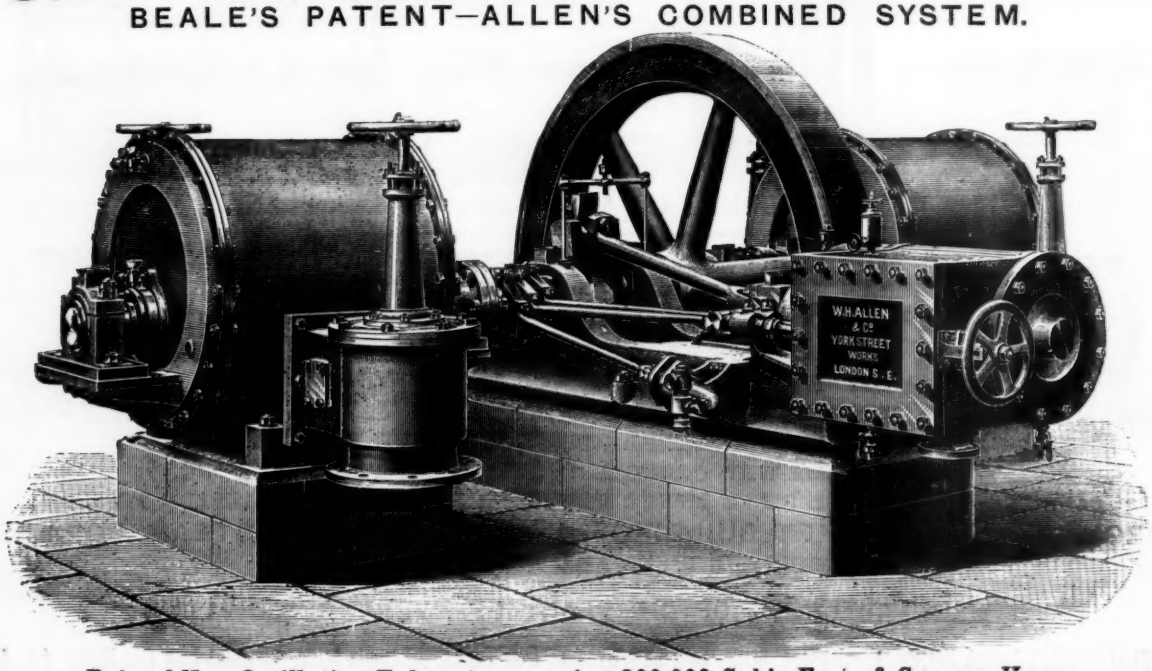

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MOST EFFECTIVELY AND *ECONOMICALLY RESTORES* LIME WASTES CONTINUOUSLY.

The Patentee having under his several Patents effected a complete solution of the Spent Lime difficulty, most confidently solicits the consideration of the fact by the Engineers and Managers of Gas Companies, Gas Corporations, and other Spent-Lime producers. The adoption of these Patents secures the following amongst other advantages, viz.:—1st. Nuisance is avoided, and the utmost convenience and comfort in Gas purification are secured. 2nd. The Lime is recovered at from one-third to one-half the cost of new Lime, or from 5s. 6d. to 7s. 6d. per Ton (depending on extent of works and working charges). 3rd. The Lime is either recovered for Building and Agricultural purposes, or specially and continuously for Gas purification—no limit being assigned to its durability. 4th. Nearly the whole of the valuable sulphur is collected and sold. 5th. By the Patentee's Improved Furnace, breeze or inferior cannel coke only is required as a fuel. The process has been worked for a considerable time by several important Gas Companies and Corporations throughout the Kingdom, and with the most satisfactory results. The Patentee erects, proves, and grants working on very moderate terms.

Further particulars may be had on application to A. F. WILSON, Esq., Assoc. M. Inst. C.E., 12, Walbrook, London, E.C., Agent for London; J. E. FISHER, Esq., Stourbridge, Agent for the rest of England, Wales, and Ireland; or to the Patentee—

GEO. R. HISLOP, Engineer, GAS-WORKS, PAISLEY, N.B.

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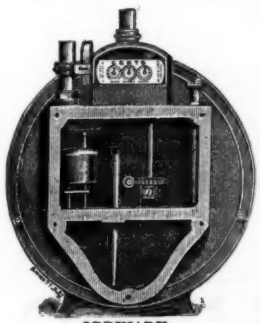

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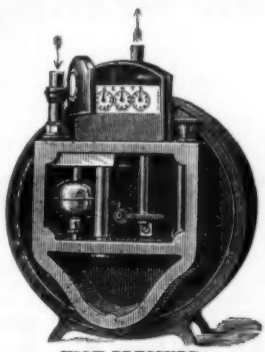

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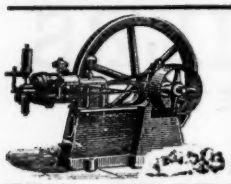

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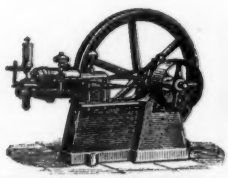

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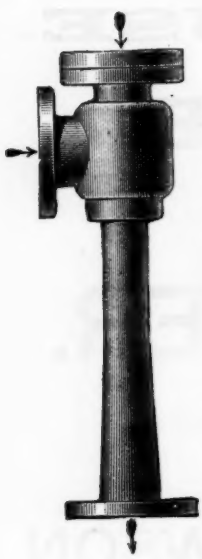

Gas Exhausters with Automatic Governor working on Steam Spindle; entirely self-acting.

Revivifying Blowers and Exhausters, for continuous or intermittent use.

Compressors to 10 lbs. per square inch and upwards; for Agitating, Mixing, Oxidizing, Elevating, &c.

Ejectors for vacuum up to 26 inches mercury.

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Most of the Appliances named may be seen in operation at the above address, by appointment.

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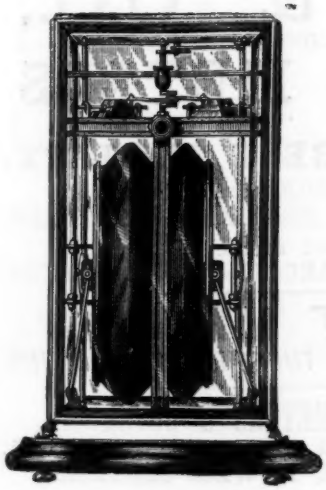
Outside Dimensions.

Size.	Depth, Back to Front.	Height, including Unions.	Width, including Unions.
Lights.	Inches.	Inches.	Inches.
2	7¼	13¾	10
3	8⅝	15	11¼
5	9½	16¼	13
10	10¾	19	15
20	13½	24½	18½
30	16⅝	27½	21¼
50	20¼	33½	26
60	21	33½	27
80	24¼	40½	31
100	25½	42¼	33¼
150	27¾	50¾	42
200	30	56¾	42¾
250	34¼	58	46¼
300	38½	69¼	49¼
400	41¾	72¼	56½
500	46	74	57½

150 Lights and upwards.

Measuring Capacity.

Size.	Bore of Inlet and Outlet.	Per Revolution.	Per Hour.
Lights.	Inches.	Cub. Ft.	Cub. Ft.
2	½	0·083	12
3	⅝	0·125	18
5	¾	0·160	30
10	1	0·3	60
20	1¼	0·5	120
30	1⅜	0·830	180
50	1½	1·428	300
60	1¾	1·6	360
80	2	2·5	480
100	2	2·857	600
150	3	5·0	900
200	3½	6·6	1200
250	3½	7·3	1500
300	4	8·3	1800
400	5	12·0	2400
500	5	14·285	3000



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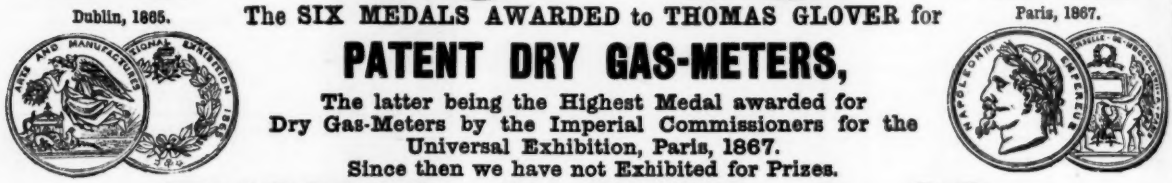
Dublin, 1865. Paris, 1867.



The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.
Since then we have not Exhibited for Prizes.

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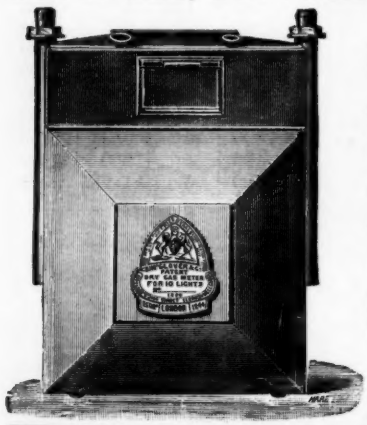
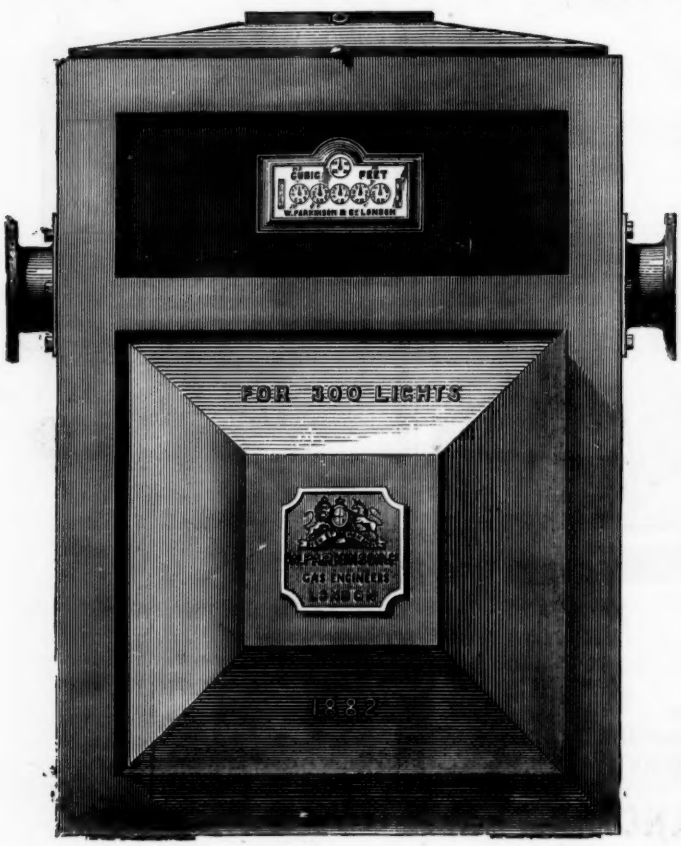


1st—Are a remedy for all the defects of Wet Meters.
2nd—Are suitable for all climates, whether hot or cold.
3rd—Incur no loss of Gas by Evaporation.
4th—Cannot become fixed by frost, however severe.
5th—Are the most accurate & unvarying measurers of Gas.
6th—Prevent jumping or unexpected extinction of the Lights.
7th—May be fixed either above or below the level of the Lights.
8th—Cannot be tampered with without visibly damaging the outer case.
9th—Will last much longer than Wet Meters.
10th—Will not cost more than one-half for repair that Wet or Water Meters do.
Are upheld for five years without charge.

Meters fitted with Grey's Index or Harding's Counter.

W. PARKINSON & CO.,



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OF THE

VERY BEST QUALITY.

The DIAPHRAGMS are of the Finest PERSIAN SHEEP SKINS.
The CASES are of the Best CHARCOAL-TINNED PLATES.

WET METERS,

With PATENT THREE-PARTITION DRUMS.

STATION METERS & GOVERNORS,

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TO ADVERTISERS.

ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion; but as the Advertisement sheet of the JOURNAL is sent to Press the first thing on Monday Morning, Advertisers will please bear in mind that Orders for Alterations in or Stoppages of PERMANENT Advertisements should be received Not Later than Two o'clock on SATURDAYS.

THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, FEBRUARY 26, 1889.

THE SOUTH METROPOLITAN COMPANY'S MEETING.

THE South Metropolitan Company's meeting on Wednesday last was well attended by appreciative proprietors, who were treated to an unusually full address by the Chairman, Mr. George Livesey. In this speech many points of interest to all gas producers will be found dealt with in the simple but powerful manner which is Mr. Livesey's own secret. Beginning with the unexciting but important question of the coke market, the speech ranged over a variety of matters up to that remarkable demonstration of the value of new business to a Gas Company which was first promulgated by Mr. Livesey in connection with the establishment of the East Greenwich works, and is now repeated with all the added weight of verification by experience. No attempt was made to explain the advance in the value of coke, which came as a welcome surprise to producers nearly two years ago. If, however, as Mr. Livesey says, the market is not now in so healthy a state in consequence of the raising of the price of the commodity, it is a pity that such a course should have been pursued—at least to such a length as to drive off old customers. It may be hoped, however, that Mr. Livesey has taken the darkest view of the facts in this regard; for it is certain that if coke is dearer, so is coal. This consideration arouses some reflections having reference to the prospective abolition of the coal dues, which event is now credited with actual reductions of the price of gas in London, as well as with a promised cheapening of coke. It will be difficult to trace any such influence, however, if at the same time the course of the market is in the direction of higher values for coal and coke. Whether as the consequence of the recent strikes, or for other reasons, coal is dearer and coke is more valuable than was the case six months ago; and if six months hence the coal dues should be removed, the selling price of neither kind of fuel will be as low as it has been. It will then be found difficult to persuade the public that the revenue hitherto derived from the dues, and devoted to Metropolitan improvements, has not been sacrificed in vain. Of course, it will then be urged that if the dues had been continued, the price of fuel would be so much higher; but an argument of this kind is not much regarded by the public. The remark that "coke was but so much a ton when the coal "dues were in existence, and it is dearer now they have been "taken off," contains a comment much more striking in the estimation of people who look only for the nearest explanations of puzzling circumstances.

Proceeding to declare the renunciation by the South Metropolitan Board of the extra dividend to which the Company might lay claim through the cessation of the coal dues, Mr. Livesey evidently had the proprietors with him, for not a single voice was raised in protest against the proposed policy. Of course, a Chairman's words carry great weight with shareholders in a prosperous Company; and Colonel Makins, M.P., had plenty of support when he recommended the very opposite course at the recent Chartered meeting. It is, however, clearly open to Mr. Livesey to claim that he carried his point without a single dissentient; while Colonel Makins had to recognize the presence of a strong minority in opposition. We remarked last week that Mr. Livesey does not like fogs, even from the standpoint of a seller of gas; and he explained the grounds of his dislike. Passing on to the subject of gas testing, Mr. Livesey pronounced a trenchant criticism upon the system under which, as we chronicled last week, the South Metropolitan Company have been recently fined. It may be worthy of remark that some of the newspapers have "improved the occasion" of these Police Court proceedings in the usual way—describing the Gas Company as habital defrauders of the public, and regretting the smallness of the penalty incurred for default in the matter of illuminating power. This attitude is, we suppose, unalterable by evidence, or a sufficient answer to the accusation might be found in Mr. Livesey's statements that an unfavourable report respecting the illuminating power of South Metropolitan gas only occurs about once in upwards of 2000 tests per annum. The most noteworthy of Mr. Livesey's observations in connection with testing arrangements, however, is his statement that he attended by request at the Board of Trade on Tuesday last, and was informed by the Secretary that the Department is ready to introduce a Bill into Parliament to place gas testing on a satisfactory basis. This is good news as it stands; but, of course, appreciation of the action in question must be reserved until it is known what line it will take.

The speech concluded with an exposition, already alluded to, of the bearing of extensions of business upon the enlargement of plant and on the earning of profits. The best proof of the effect of the speech as a whole upon the auditory is to be found in the fact that there was not a single question asked, nor comment offered, from the shareholders' side of the table. It is possible that, as it was Mr. Livesey's turn to retire, and offer himself for re-election, at this meeting, he may have determined to do his best to make himself interesting; but, at any rate, the fact remains that the speech was unusually good, even for Mr. Livesey. It is just worthy of remark that Mr. Livesey's bitter enemy, Mr. George Bray, who made himself so conspicuous at the previous meeting of the Company by

attacking the Chairman, lost the opportunity for renewing the onslaught presented by Mr. Livesey's retirement and candidature for re-election; and the meeting accordingly passed off without the "scene" that Mr. Bray's performance in August, and his threats that the matter of his accusation "would not be allowed to remain where it was," might have led one to expect. This is rather to be regretted; for since Mr. Bray will neither leave Mr. Livesey alone, nor bring his accusations against him to the test of a Court of Law, the South Metropolitan meetings are the best possible field for his operations.

THE REMUNERATION OF GAS ENGINEERS ACCORDING TO THE SOCIAL DEMOCRATIC STANDARD.

Another count in the indictment of local authorities for being incapable of properly administering gas undertakings is being provided by the Birmingham Town Council, in connection with the recommendation of the Gas Committee to increase the salary of Mr. H. Hack, one of their Engineers. We do not propose to discuss the delicate personal question of Mr. Hack's remuneration; but will take up the subject at the point where the Gas Committee left it—namely, that Mr. Hack's salary should be increased by a certain amount. Formerly this would have been done by the Gas Committee without consulting the Council; but, pursuant to an arrangement recently come to on this and other matters, the Committee merely made a recommendation to this effect to the general body. When the subject came up for settlement, however, a section of the Council, known locally as representing the "labour interest," opposed the advance, alleging the existence of so much dissatisfaction with Mr. Hack's government among the workmen employed under him at Saltley as would suffice, if justified, to render his position untenable. The Committee appear to have been taken by surprise, and withdrew their recommendation with a view to inquiring into the charges thus sprung upon Mr. Hack. In the meantime, the local newspapers have taken up the matter; the workmen and their representatives, who have many votes to Mr. Hack's one, being permitted every opportunity for influencing public opinion in their behalf. After all has been said, however, the result is ludicrously hollow, and goes to prove that Mr. Hack is a good servant of the public and the Corporation, who will not allow the undertaking to be robbed of due returns for money paid as wages. For this he is gibbeted as a tyrant; whereas if he had made a practice of employing two men at full wages to do one man's work, and had spent his evenings in spouting at public-house gatherings of Social Democratic workingmen's clubs, he would be lauded as a Friend of the People. The same kind of thing is to be seen in full swing at Salford, where a mass meeting of "ratepayers," convened by the local branch of the Social Democratic Federation, has passed a resolution protesting against the increase of Mr. Shoubridge's salary. Mr. Shoubridge has saved the town some thousands a year in money, besides putting the gas-works upon a better footing than they ever occupied before; and, in consideration of this good service, he is awarded an additional £100 per annum. This amazing prodigality has roused the indignation of the Social Democrats. Some two thousand of them, more or less, met together at the end of a street last Sunday week; and the mover of a resolution condemning the action of the Council declared, amid applause, that "as long as men were employed at the gas-"works at 17s. per week, no man had a right to get more "than £500 a year." To do so is, in this speaker's estimation, to "plunder the working classes." This is the sort of thing that local authorities have to cope with, and that renders it difficult for them to do justice to professional men in their service. The Social Democratic method of estimating the worth of a man's work is not according to the value of the man himself, but according to the value of some other man. It is to be noticed, moreover, that this particular Social Democrat of Salford is anything but consistent. Why should he deny the right of any man to "get more than £500 a year," while another man is paid only 17s. per week? Why is the line drawn at £500, and not at the minimum rate of wage? If this Social Democrat had argued for the payment of 17s. per week all round, to the Manager as well as to the day labourer, one could credit him with consistency, even though carried to the extreme. Consistency vanishes with common sense, however, before the attempt to establish any connection between a salary of £500 a year and a wage of 17s. per week, such as would make the one excusable by the other. Yet these orators and their hearers are the people to whom town councillors truckle for votes, and before whom they fear to be honest. This mob influence is happily not in the ascendant yet, even in Salford or Birmingham. It can make itself felt disagreeably, but does not carry everything before it. We prefer not to anticipate what the result might be if it should ever gain the upper hand in the administration of local affairs.

THE ANNUAL MEETING OF THE MIDLAND ASSOCIATION.

The members of the Midland Association of Gas Managers held their annual meeting in Birmingham on Thursday last, when the President (Mr. Charles Taylor, of Derby) read the interesting Inaugural Address which will be found in another column. The proceedings extended besides to the discussion of a paper on high carbonizing temperatures, contributed by Mr. Taylor to the last meeting of the Association; and concluded with a dinner. The discussion on Mr. Taylor's paper was marked by many valuable observations upon points of carbonizing practice, and will form a worthy contribution to the literature of the subject. Taking the remarks of the Midland gas managers in conjunction with Mr. Somerville's observations upon the same subject in his recent address, it is possible to say that gas engineering opinion is pretty well agreed upon this matter. In a general way, it has come to be understood that the higher the heat at which coal can be conveniently carbonized the better. It is true that there are some varieties of coal which do not give their best results when carbonized at too high a temperature; but, as a rule, the limit of temperature of retorts is fixed out of regard to other considerations, such as the risk of stoppages in ascension-pipes. With respect to the formation of naphthalene when working at high heats, it is probable that Mr. R. O. Paterson is right in thinking that the best way out of this difficulty does not lie in shirking it by keeping down the heat. When a process, good in itself, is found to entail some incidental disadvantage, although it is permissible to avoid the latter, when sufficiently important, by temporarily suspending the process, such a way out of the difficulty does not recommend itself to a really conscientious worker. As Mr. Paterson put it, he wants to reap the advantages and discover some way of preventing the drawbacks attendant on the process. In the case in point, the temperature of the gas as produced might offer some indication of the true way to solve the problem. This is only a suggestion; but we offer it for what it is worth. Where a higher heat of carbonization than is commonly adopted is found to result in naphthalene deposits, it may be that the condensing arrangements, although suitable in the ordinary way, are rendered inefficient by the change in carbonizing practice. At any rate, careful study of the rate of condensation, and of the treatment of the tar, seem to afford the best hope for effectively dealing with the naphthalene nuisance. As remarked at the meeting, carefully watched experiments on the working scale, with different coals of uniform quality, should do much to eliminate uncertainties from this interesting question.

THE RECENT HISTORY OF THE BRISTOL GAS COMPANY.

There have been many remarkable episodes in the recent history of the Bristol United Gaslight Company, since the time when the Local Authority vainly tried to force a reduction in the price of gas by the application of the familiar powers of the Act of 1847. Then came a period when the Company did not earn their dividend; but this circumstance was of small importance, so far as the condition of the undertaking was concerned, and only calls for mention because of what followed. The Secretary, who had served the Company long and honourably, retired, and a successor was appointed. Mr. R. W. Giles was elected on the Board. Mr. Walter Fiddes, who, as Engineer and Manager, had become, through long connection, identified with the Bristol Gas-Works, left the Company's service; two new Station Managers were added to the staff; and, after an interregnum, which we flatter ourselves was shorter than it would probably have been but for our protests, Mr. William Fiddes was appointed Chief Engineer. Last of all these shifts and changes, Mr. Giles's rather brief but stormy and eventful official life as a Director was summarily extinguished this day week, by the passing in general meeting of a resolution removing him from the Board, and reducing the number of Directors from nine to eight. All these occurrences in the administration of a steady-going old Gas Company that had had no history, in the sensational sense, for many years previously, must have shaken up the old organism like an earthquake. It is no part of our duty to pass in review such affairs as those which have recently agitated the Bristol

Gas Company and pronounce judgment upon the individuals concerned. We certainly protested against such an important concern trying to work short-handed, and without the most important officer of a Gas Company's staff; but we did this on general grounds, and should never think of proceeding to criticize the selection of persons to fill appointments. Similarly, with regard to Directors, it is no affair of the public whether the Bristol Gas Company elect to entrust their business to the control of eight Directors or nine; or whether Mr. Giles is removed from, or remains upon the Board. We may be permitted to remark, however, that when one Director deliberately sets himself against the rest, he must either turn them out and persuade the proprietors to replace them with others with whom he can work in unity, or they must remove him. Divisions on a Board are, of all things, inadmissible. Every Director owes allegiance first and foremost to the Company as a whole; and this duty forbids him to be a party to anything calculated to be detrimental to the Company and to depreciate its stock. Divisions on the Board are certain to result in this way; for where Directors quarrel, officers follow suit and take sides, and plots and cabals all through the staff and ranks divert attention from business. The ultimate court of appeal for a Director who dissents radically from the policy of his colleagues on the Board is the shareholders; and instead of dividing the Board, the dissentient member should lay his case before the proprietors on the first opportunity, and request them to choose between him and his opponents. If he is defeated, it is not a life-and-death matter, but only a question of the pocket. He is nowise compelled to leave his money under the care of men whom he distrusts; he can sell out, and transfer his interest elsewhere. If his fellow-shareholders do not choose to accept his warnings and follow his example, so much the worse for them if he is in the right. At all events, he will have discharged his obligation. This is the only proper way of looking at the matter. If a dissentient Director will not publish his protest and retire, there is nothing for it but his removal by his stronger colleagues. In any case, the paramount necessity for unity on a Board must be served. It is to be hoped, with the removal from the Board of the irreconcileable minority, peace may return to the distracted Bristol Company.

THE MEETING OF PARLIAMENT.

Parliament met last Thursday; and though the programme of legislation contained in the Queen's Speech is not very remarkable, it is understood that the session will be devoted to important, if unostentatious, work. The legislative aspirations of private members are numerous and varied, as usual; and this year embrace several matters in which our readers may be supposed to be more or less interested. A last attempt is to be made by Mr. Baring and Sir Robert Fowler to continue and appropriate the London Coal and Wine Dues; but, by way of a counterblast to this, there is a Bill of Sir Joseph Pease to abolish any duties on coal leviable by the Corporation of London. There is nothing to be said respecting the former measure, which is only the expiring protest of the partisans of the condemned dues; but the latter calls for some explanation. It has been claimed by the Corporation of the City of London that they are legally entitled, under an old statute, to levy duties on coal up to 4d. per ton under certain conditions; and they have intimated their intention of not allowing these powers to fall into desuetude, whatever may be the fate of the existing Act under which this ancient due is combined with some others of different creation. The friends of the coal interest and the foes of the Corporation have combined to put a stop once and for ever to all such special privileges of the City; and accordingly Sir Joseph Pease's Bill is backed by Lord Randolph Churchill and five other members, including Mr. Burt. Both Bills have been read a first time and ordered to be printed, so that their provisions will soon be made known. Another measure of which notice has been given is Mr. Woodall's annual Bill for the amendment of the Borough Funds Act, which never seems to get any nearer acceptance as the years go by. Mr. Craig-Sellar, also, is again looking after the reform of Private Bill Procedure. Indeed, to scan the orders at the commencement of a parliamentary session is a diversion which might be fitly recommended to a cynical philosopher, or rather, perhaps, to an amiable moralist of a pessimistic turn. Here may be seen a wonderful collection of what irreverent persons class indiscriminately as "hobbies," although among them may be found projects to which it would be unfair to apply such a term. The true legislative hobby is to be recognized at a glance. He is a creature warranted to carry his rider safely through any number of sessions without ever rushing into inconvenient prominence, or coming hopelessly to grief. He often has a taking name and a showy action; and his rider rocks himself comfortably on his back while thinking, or pretending to think, that he is "going to business." Nothing would be more regretted by the true hobby-rider, however, than such a depravation of his hack as would ensue upon getting him into harness for real work. He is in the same position as the secretary of a voluntary association for the abolition or promulgation of something, whose care is to get up just so much steam as will keep the machine moving while he cares to ride on it, but not enough to disestablish himself by arriving too quickly. Statesmen, politicians, demagogues, reformers, talkers, hobby-horse riders—they are all assembled at St. Stephen's once more; and the legislative windmill is getting to work again, with what results only time can show.

Prizes for Electric Light Meters.—The Paris correspondent of the *Daily News* states that the Paris Municipality have offered a prize of £400 to the inventor of the most reliable system of computing the quantities of electric light used, and also five other prizes of £80. If any system is only applicable to a continuous or to an alternative current, half the amount offered will be given.

Reductions in Price by the Commercial and Crystal Palace District Gas Companies.—The Directors of the Commercial Gas Company have resolved to reduce the price of gas to 2s. 4d. per 1000 cubic feet as from the 31st prox. The Directors of the Crystal Palace District Gas Company have resolved to reduce the price of gas to 2s. 7d. per 1000 cubic feet from and after the date of the Lady-day quarter's accounts.

Manchester District Institution of Gas Engineers.—The nineteenth annual meeting of this Institution will be held at the Technical School, Princess Street, Manchester, on Saturday next. The programme which has been issued by the Honorary Secretary (Mr. Harrison Veevers, of Dukinfield) shows that, as usual at the first gathering of the members in the year, the business will consist chiefly of the delivery by the new President (Mr. T. Banbury Ball, of Rochdale, who succeeds Mr. Thos. Duxbury, of Darwen) of his Inaugural Address; the other matters being the reception of the Committee's report for the past year, and the election of officers for the current year. At the close of the proceedings the members will take tea together at the Crown Hotel.

Death of Mr. S. P. Leather.—We regret to have to record the sudden death early last Wednesday morning, in his sixty-eighth year, of Mr. Samuel Petty Leather, the Engineer and Manager of the Burnley Corporation Gas-Works. Mr. Leather had been suffering from chronic bronchitis, but was able to attend to his duties last Tuesday; and during the day expressed himself as feeling somewhat better than usual. About midnight, however, he was seized with a violent attack of coughing; and before medical assistance arrived death had ensued. Mr. Leather was one of the oldest servants of the Corporation—having held the position of Engineer for 27 years; and it is largely due to his excellent management that the gas undertaking has been and is one of the most profitable of the Corporation departments.

Eastern Counties Association of Gas Managers.—We learn from the Hon. Secretary of this Association (Mr. H. Wimhurst, of Sleaford) that a very attractive programme has been arranged for the first general meeting of the members, which is to take place at Grantham on the 20th prox., under the presidency of Mr. W. Barratt, the Engineer and Manager of the Grantham Gas Company. In view of the interest displayed in connection with the formation of the new Association by the gentlemen who now constitute it, there is no doubt their first business meeting will be in every way a success. Apart from the matters relating to their special branch of engineering which may come before the members, they will have an opportunity of extending their acquaintance with other branches, by availing themselves of the opportunity which will be then afforded them of visiting the world-famed works of Messrs. R. Hornsby and Sons, Limited.

New England Association of Gas Managers.—The annual meeting of this Association was fixed to be held in Boston on Wednesday and Thursday last, under the presidency of the Hon. A. M. Norton. According to the notice of the meeting issued to the members by the Secretary (Mr. C. H. Nettleton), the following papers had been promised:—"The Springer Process," by Mr. H. S. Chase; "Incidents in the Life of a Superintendent of a Small Gas-Works," by Mr. A. F. Cooper; "The Use of Lime Oil for Enriching Gas," by Mr. J. L. Hallett; "Elements of Gas Analysis," by Mr. E. C. Jones; Artistic Articles used in connection with Artificial Lighting," by Mr. R. J. Monks; "The Report of the Committee on Photometric Standards," by Mr. C. F. Prichard; "Gas and Electricity," by Mr. S. G. Stiness. These papers, if presented, contained ample material to occupy the members during the two days of the meeting; but, in addition thereto, arrangements had been made for the delivery of a lecture by Dr. Lewis M. Norton, of the Massachusetts Institute of Technology, on "The Composition of Boston Gas." The proceedings will be noticed at length in subsequent issues of the Journal.

Essays, Commentaries, and Reviews.

THE AFFAIRS OF THE GAS INSTITUTE.

Although we keep to the same heading for this article as for its precursors, in reality we have little or nothing to announce respecting The Gas Institute this week, beyond the retirement of Mr. Alfred Hersee, fellow-Auditor with Mr. Alfred Lass of the accounts of the Institute for many years. It is regrettable that gentlemen who have served the Institute so long, and deserved so well of the members, should be driven to withdraw without receiving the acknowledgment of their kind offices which their fellow-members would so willingly render; but this is one of the awkwardnesses of the situation.

The statement which is given below as to the constitution of the Provisional Committee of the new organization up to date, more than redeems our half-promise of last week. In publishing it, we have only one regret—that it does not contain the names of the members of the Council of The Gas Institute. Remembering what agency there is for the creation and dissemination of misrepresentations of the objects and functions of this Committee, and for the fostering of dissensions between the past and present members of the Institute, we think it may not be superfluous to declare once more that this new movement is no cause of disunion except for those who choose to make it so. The men who are identified with it are no such foes of the old Institute as are those who would perpetuate it in name and form—after its spirit has fled. The message of those who have left the Institute, to those of their brethren who have the freedom of choice in the matter is, "We cannot remain, for reasons that you know of; but you can come to us, and heartily welcome." The retiring members of the Institute have been made the victims of a combination of influences and circumstances which came upon them unsought. They have shaken off the incubus, albeit at the cost of the rupture of many cherished associations; and there is now every prospect of a fair start under none but benign conditions. Again we say, there is no quarrel in all this. From this time the responsibility for keeping open a division in the ranks of the gas industry rests with the members of the Council of the old Institute, who by maintaining silence respecting the possibility, from their point of view, of escaping from the dilemma in which the Institute finds itself, lend force to the argument that there is no other course than starting afresh. We do not hesitate to say that if anybody had come forward at any time during the past two months with a feasible scheme for the rehabilitation of the Institute, this Committee would never have been formed. Even now, if such a scheme can be evolved, the Committee will pay every regard to it, and give it preference to the alternative of founding a new organization. What a very grave responsibility therefore rests upon Mr. Garnett and his five colleagues—whether for allowing this movement to go on from the outside, weakening the Institute of which they have assumed command, while they could stop it immediately by producing an acceptable plan of reform, if they have one; or for pretending to keep the Institute together, while knowing that they will have nothing better to offer to the members at the next general meeting than the lame and futile programme which they issued at the beginning of the year! Is it a sense of *amour propre* which keeps the old Council from abandoning an untenable position, and ceasing to make their "noble stand in defence of the Institute," as their conduct has been characterized by rash friends who fail to realize the facts of the case? If so, they may rest assured that nobody wishes to reproach them with the ignominy of failure in the attempt to perform an impossibility. They have been challenged to a statement of policy by those who, like ourselves, think they have committed a blunder, and who have made no secret of their own intentions. The position now is this: If no better course is suggested, the gentlemen whose names are given below will soon proceed to start a fresh organization, to be representative of the gas industry. They are not at present committed to this; for they can look into The Gas Institute, of which many of them are still members, and see if it can be made to answer their declared purpose. The presumption is, undoubtedly, that this is not to be hoped for; and this opinion rests upon a certain view of the circumstances of the case, the accuracy of which has never been shaken by any presentment from another standpoint, although often called for. An altogether new organization can be formed upon any lines that may be settled by the Provisional Committee; and if they do their work only reasonably well, the actual and possible defection from the old Institute which this list represents will be largely increased. The point is, Can the Council of the old Institute do better than this for the industry? If not, they ought, on the general ground, to cease from dividing the members, altogether apart from the consideration that they are making of themselves the screen for those whose interest in fomenting disunion is personal. If they will only pause and reflect that the differences which part them from their whilom associates who form the new Committee are as nothing compared with the divergence of motives between themselves and those whose game they are playing, the influences of disunion will be neutralized, and the industry will once more present a single front to the world. There is no obstacle, personal or otherwise, to this consummation on the side of the new Committee; if any disinclination to fusion exists, it is on the part of the old Council. There should be nothing, however, to prevent a joint consideration of the emergency; and for a last means of restoring union we therefore suggest that Mr. Garnett and one or two of his supporters should take steps to arrange for a conference with Mr. Colson and an equal number of friends to be chosen by him, in order to see whether a reconciliation cannot be brought about before June.

GAS ENGINEERS NEW ORGANIZATION.

To the Editor of the Journal of Gas Lighting.

Sir,—With reference to my circular letter of the 31st ult., I have now the satisfaction of stating that the Provisional Committee is composed as named below. I hope shortly to convene a meeting; and in the meantime shall be glad to receive the names of any other gentlemen to whom invitations have been sent, and who may be desirous of joining the Committee.—Yours faithfully,

Alfred Colson, Hon. Sec. *pro tem.*

Gas Offices, Leicester, Feb. 23, 1889.

Names of those who have joined the Provisional Committee.

Acland, T.	Rhymney Gas-Works, Pontlottyn, near Cardiff.
Baker, E.	Gas-Works, Reading.
Barton, J.	Gas-Works, Peterborough.
Bell, J. F.	Gas-Works, Stafford.
Botley, C. E.	Gas-Works, Hastings.
Braidwood, J. F.	South Metropolitan Gas Company, Greenwich.
Broadberry, W. H. H.	Gas-Works, Tottenham, London, N.
Browne, A. F.	South Metropolitan Gas-Works (Rotherhithe Station) London, S.E.
Burgess, J.	Gas-Works, Leeds Road, Huddersfield.
Bush, F.	South Metropolitan Gas Company, Old Kent Road, London, S. E.
Canning, T.	Gas-Works, Newport, Mon.
Carpenter, C. C.	Gas-Works, Bridge Foot, Vauxhall, S.E.
Carr, I.	Gas-Works, Widnes.
Chamberlain, H. B.	British Gaslight Company, Holywell.
Chapman, J. L.	Gas-Works, Harrow.
Cocker, J. L.	Gas-Works, Merthyr Tydvil.
Colson, A.	Gas-Works, Leicester.
Cooper, W. R.	Gas-Works, Banbury.
Cox, J. H.	Gas Office, Fawcett Street, Sunderland.
Cox, J. H., Jun.	Gas-Works, Hendon, Sunderland.
Cross, W.	Gas-Works, Leamington.
Crowe, H. G.	Gas-Works, Wellington, Somerset.
Davis, W.	Brampton Villa, Seldown, Poole.
Dougall, A.	British Gas-Works, Hull.
Dougall, A., Jun.	Gas-Works, Tunbridge Wells.
Durkin, S. W.	Gas-Works, Southampton.
Eastwood, C.	Gas-Works, Bootle, Liverpool.
Eldridge, J.	Gas-Works, Oxford.
Ellis, H. D.	Commercial Gas Company, Stepney, London, E.
Featherstone, W. B.	Gas-Works, Dundalk, Ireland.
Folkard, C. W.	Gas-Works, Bournemouth.
Foulis, W.	Gas-Works, Glasgow.
Gandon, C.	Crystal Palace District Gas-Works, Sydenham.
Giles, T.	Gas-Works, Bridport.
Glover, S.	Gas-Works, St. Helens.
Goddard, D. Ford	St. Margaret's House, Ipswich.
Green, H.	Gas-Works, Preston.
Green, J. V.	Gas-Works, Bristol.
Greenough, M. S.	Gas-Works, Boston, Mass., U. S. A.
Guyatt, T.	Ceará Gas Company, 9, Queen Street Place, E.C.
Hack, H.	Gas-Works, Saltley, Birmingham.
Hardie, W., Jun.	Gas-Works, North Shields.
Harris, R.	146, Goswell Road, London.
Helps, G.	Glenavon, Newbridge Road, Bath.
Higgs, W.	Gas-Works, Basingstoke.
Humphrys, F. C.	Gas-Works, Ilkeston.
Hunt, C.	Gas-Works, Windsor Street, Birmingham.
Jolliffe, J. T.	Gas-Works, Ipswich.
Ker, A. P.	Gas-Works, Windsor Street, Birmingham.
Key, W.	Southside Gas-Works, Glasgow.
King, W.	Gas-Works, Liverpool.
Kitt, A.	The Gaslight and Coke Company, Grosvenor
Lane, D.	72, South Mall, Cork. [Road, Pimlico.
Lane, G.	Gas-Works, Aylesbury.
Laycock, J.	Gas-Works, Keighley.
Leather, S. P.	Gas-Works, Burnley.
Lewis, J. T.	Gas-Works, Wellingborough.
Linging, F. E.	British Gaslight Company, Norwich.
Linton, F. T. C.	4, Assembly Street, Leith.
Littlewood, W.	Gas-Works, West Bromwich.
Livesey, F.	South Metropolitan Gas-Works, Old Kent Road, London, S.E.
Livesey, G.	5, Camden Park, Tunbridge Wells.
Lloyd, E. J.	Windspoint, Knowle Road, Totterdown, Bristol.
Lupton, J.	Gas Department, Municipal Offices, Leeds.
Mann, W.	Wellesley Road, Gunnersbury, W.
Marshall, F. D.	Danish Gas Company, Copenhagen.
May, T.	Gas-Works, Canterbury.
May, T., Jun.	Gas-Works, Richmond, Surrey.
Mead, F.	Gas-Works, Sutton, Surrey.
Meiklejohn, C.	Gas-Works, Oldbury.
Meiklejohn, N.	Gas-Works, Longwood, near Huddersfield.
Methven, J.	The Gaslight and Coke Company, Nine Elms.
Mitchell, A.	Gas-Works, Bury St. Edmunds.
Mitchell, H. J.	Gas-Works, Hornsey, N.
M'Minn, A. C.	The Gaslight and Coke Company, Kensal Green.
Moon, W. J.	2, Belgrave Cresent, Scarborough.
Morris, J.	Gas-Works, Jersey.
Morton, R.	10, Endsleigh Gardens, London, N.W.
North, W.	Gas-Works, Stourbridge.
Ohren, Magnus	Crystal Palace District Gas Offices, Sydenham.
Parlby, W.	Gas-Works, Hereford
Paterson, J.	Warrington.

Paterson R. O.	Gas-Works, Cheltenham.
Penney, J. H.	Gas Company, Chapter Row, South Shields.
Pike, E. S.	Gas Offices, High Street, Reigate.
Price, W. E.	Gas-Works, Hampton Wick.
Read, C.	Gas-Works, Redhill, Surrey.
Reeves, J. S.	Gas-Works, Bilston.
Riley, J.	Rossendale Union Gas Company, Cloughfold, near Manchester.
Shoubridge, S. Y.	Borough Gas Offices, Bloom Street, Salford.
Smith, A.	Gas-Works, Aberdeen.
Smith, B. W.	Gas-Works, Smethwick.
Smith, R.	New Wortley Gas-Works, Leeds.
Smythe, H.	Gas-Works, Maidstone.
Somerville, J.	70, Bankside, London, S.E.
Stevenson, E. H.	38, Parliament Street, Westminster, S.W.
Stevenson, F. W.	Gas Co.'s Offices, Commercial Street, Sheffield.
Stevenson, S. E.	(late of Colchester), Montreal.
Taylor, C.	Friars Field, Derby.
Tew, W. T.	35, Saltisford, Warwick.
Thomas, H.	United Gas Company, Sheffield.
Thorman, J.	West Ham Gas-Works, Stratford.
Trewby, G. C.	The Gaslight and Coke Company, Horseferry Road, Westminster, S.W.
Tysoe, J.	South Metropolitan Gas-Works, East Greenwich
Valon, W. A.	Gas-Works, Ramsgate.
Walker, T.	Gas-Works, Wrexham.
Warner, W. J.	Gas-Works, South Shields.
Weeks, O. J.	Gas-Works, Cambridge.
Whimster, J.	Gas-Works, Armagh.
Whitaker, J. W.	Gas-Works, Wakefield.
Wilkinson, P. H.	Craven Lodge, Harrogate.
Wilton, J.	Gas-Works, Silvertown, North Woolwich.
Wood, C.	Gas-Works, Thornton Road, Bradford.
Woodall, Corbet	Palace Chambers, Westminster.
Woodall, Henry	Manor House Hotel, Leamington.
Yorston, A. J.	Gas-Works, Ely, Cambs.

We learn that Mr. H. T. Armit, of Northampton, is about to leave England to take the appointment of Assistant-Engineer of the Santiago Gas Company.

At the students' meeting of the Institution of Civil Engineers last Friday, Mr. T. A. Guyatt read a paper entitled "Some Considerations in Favour of Gas-Producing Furnaces in preference to other Types, with Notes on their Construction and Working."

Under the title "The True Position of Patentees," Mr. H. Moy Thomas has published, through Messrs. Simpkin, Marshall, and Co., a little book, in which the patent laws and regulations at home, abroad, and in our Colonies and dependencies, are explained for the information of English inventors.

Mr. J. Hoggard, who has been for the past four years foreman at the Batley Corporation Gas-Works, is about to leave, to take the appointment, under his former chief (Mr. T. Holgate, F.C.S.), of Superintendent of the Halifax Corporation Gas-Works. Before going to Batley, Mr. Hoggard was for eleven years foreman at Darlington, whither he went from the Scarborough Gas-Works, where he was engaged for six years.

Our readers' attention may be usefully directed to the patent "Diamond" oil-filter, which is being manufactured by the Woodhouse and Rawson Electric Supply Company, Limited. The importance of having lubricating oil absolutely free from dirt and grit is acknowledged by all engineers and machinists; and the "Diamond" filter offers a ready means of obtaining it. The filter combines a quadruple cleansing apparatus in a single instrument; and the filtering material only requires changing a few times in a year. It can be placed in any engine or boiler room; and, being subject to but little wear and tear, is very economical in working.

Mr. R. Price-Williams read a paper last Tuesday in connection with the Royal Statistical Society, on "The Coal Question." He quoted a number of figures to show that at the average increased rate of output during the last 20 years, the coal supply of the northern fields would be exhausted in 94 years; that of the South Wales coal basin in 79 years; that of the eastern division of the South Wales coal-field in 46 years; that of Lancashire and Cheshire in 74 years; that of Yorkshire, Derbyshire, and Nottingham in 90 years; Warwickshire, 53 years; Denbighshire and Flintshire, 250 years; Scotland, 92 years; and other districts in the United Kingdom not included in the foregoing, 102 years. He expressed a hope that, by drawing attention to this most vital subject, further strenuous efforts might be made to husband our coal resources in every possible way.

The Commissioners of Sewers meet to-day (Tuesday) to consider the report of the Streets Committee recommending that tenders should be invited for the lighting of certain portions of the City by electricity. Three districts have been defined—the first embracing the neighbourhood of St. Paul's; the second, the area extending from St. Martin's-le-Grand to the Mansion House; and the third, the whole of the eastern portion of the City as far as Aldgate. The recommendation of the Committee suggests immediate action; and appearances seem to indicate the Anglo-American Brush Company as the "undertakers" who will be invited to carry out the scheme. The Committee's proposal will not slip through the Council unopposed; for we observe that Mr. C. T. Harris has given notice of an amendment, to receive the report and defer its consideration pending the decision of the Board of Trade on the applications of two other electric lighting companies for power to supply electricity within the City.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 405.)

The past week opened rather dull in the Stock Exchange, owing to various causes, mostly political; and business throughout remained upon a very limited scale. An improved tendency, however, set in before the close. Consols are firmer, under the influence of a favourable condition of the Money Market. The Gas department has been considerably quieter; and transactions have been very limited. There seems to be a feeling of indecision whether to buy or to sell—with the result of neither being done. On the one hand are the various electric schemes now being pushed forward, and the unblushing puffery employed to advocate some of them, which agitate the breast of the timid shareholder till he almost makes up what he calls his mind to realize his gas stock; and on the other, are the irrefragable facts and figures which show what good business the Companies have quietly been doing in 1888. The two larger Metropolitan Companies some time ago issued their accounts, and announced reductions in the price of their gas. The third Company, the Commercial, are now going to reduce their price by 2d. per 1000 feet—a policy which is believed to be based upon the excellent accounts they will show for the last half year, evidencing a most satisfactory increase in their business. These reductions in price will authorize the Companies to declare proportionately increased dividends for the current half year—a consideration which operates to deter the shareholder from selling. Stock in general is consequently scarce in the market. There was a slight tendency in the course of the week to depress Gaslight "A," and the quotation was lowered 2; but the final markings on Saturday looked as if the "bears" were not going to do much with it. South Metropolitan "A" has been repeatedly done at 326—big figures, but nothing compared to what we may see this day six months. Commercials are a little higher; but there is no business in them, as people will not sell and cannot buy. Nothing has been done among Suburbans and Provincials; and very little in the Foreign division. Prices have not been particularly good; and the only move is an advance of 1 in British. Water has shown a good deal of activity and general firmness. A further rise of 2 has been effected in East London.

The daily operations were: On Monday the business in Gas was mostly in Gaslight "A," which fell 1; but Commercial old rose 2, and the new 1. Water was moderately dealt in at existing prices. Gas transactions continued to be much restricted on Tuesday, and without any change. Dealings in Water were confined to West Middlesex. On Wednesday, both Gas and Water stocks were extremely quiet; a very limited amount of business being done at about average figures. Thursday's business in Gas was even quieter still—below the average of a Saturday. Water, however, was much more active. Quotations throughout remained unchanged. On Friday, South Metropolitan "A" was most in demand. Gaslight "A" was flat, and fell 1. Water continued pretty brisk, and East London advanced 1. There was more doing in Gas on Saturday, chiefly among the Foreign undertakings. British rose 1. Gaslight "A" was done at 258; but the quotation remained without variation. In Water, the only mark was 211½ in East London, with a further rise of 1 in the quotation.

ELECTRIC LIGHTING MEMORANDA.

THE BARNET FAILURE—LITIGATION RESPECTING THE EDISON LAMP PATENTS THE SOCIETY OF ARTS' REPORT UPON PRIME MOTORS—THE AFFAIRS OF THE BRIGHTON ELECTRIC LIGHT COMPANY.

The most interesting subject of comment in connection with electric lighting matters during the past week or two, is the Barnet experiment. In last week's Journal appeared a report, specially supplied from an authoritative source, of the actual performance of the Barnet electric street lamps, which gives abundant justification for the action of the Local Board in ordering an investigation of the manner in which the contract is being carried out. It was also put upon record that the manner in which the inquiry was to be conducted was at least open to the charge of favouring the contractor. This week we give in another column the report of the expert, Mr. W. H. Preece, to whom was confided this investigation. It will be seen that, although every advantage was accorded to the contractor, not even Mr. Preece could certify that the task undertaken by Mr. Joel is being satisfactorily performed. The best that can be said for him is that the plant is capable theoretically of doing the work expected of it. But there is no reserve of power such as should be provided for safety; and this does not dispose of the record that, as a matter of fact, the service is not satisfactory. When the report of the expert was considered by the Local Board, there was a strong expression of opinion in favour of determining the contract forthwith; but this was eventually modified into a demand that the contractor should fulfil the terms of his engagement within 14 days. Mr. Joel therefore gets a fortnight's grace to put himself right with the Local Authority, failing which his contract will probably be summarily determined. It is a mere repetition of the experience of Leamington and other towns. The electric lighting might be passable on occasion, if everything went right and theoretical efficiencies were realized in practice; but in the ordinary way of working, when the contractor tries to carry on his business under commercial, as distinguished from test conditions, the result is failure to satisfy the public.

Judgment has been given in the great appeal case of the Edison and Swan Company against the Brush Company and others, with the result that the jeopardized lamp patents of the appellants are once more upheld. The matter is not finished yet, however, for of course the defeated party have carried the appeal to the

House of Lords. Divested of technicalities, the point at issue is whether the Edison and Swan Company are to have the monopoly of manufacturing incandescent electric lamps in this country; and the commercial importance of the matter is unquestionable. Our contemporary, the *Electrical Review*, holds that the facts pertinent to the issue are not rightly understood by the Judges, who, like the general public, are thought to be dazzled by the reputation of Edison. It is remarked that Edison is credited not merely with what he actually did, but also with much that should be assigned to others working on the same lines. It is so exceedingly difficult as to be practically impossible to justly apportion, at some subsequent period, the respective shares of inventors who were working upon something which was "in the air," and which they all, or one of them, eventually succeeded in perfecting. The world sees the achieved result, and usually persists in crediting it to some favourite inventor; but general opinion is often unfair to the many in order to exalt the one. We see this in connection with most inventions which have formed the starting point of new industries. There is no agreement respecting the authorship of railways, coal gas, steam navigation, telegraphy, telephony, and a score of other triumphs of material civilization. It is only a phase of the immemorial controversy as to whether the hero, or his time and circumstances, should be credited with the deeds associated with his name in history. Carlyle is all for the personality; Spencer for the environment. When the issue involves money as well as fame, the controversy becomes acute, as in the instance in point. It will probably make little difference to the world, however, whether the profits of incandescent electric lamp making go to the Edison and Swan Company or to other makers. As to the personal fame, it is probably correct to say that Edison has already been endowed by popular selection with such immortality as may belong to the inventor of the incandescent electric lamp.

The report of the experts appointed by the Society of Arts to determine the comparative merits of prime motors suitable for electric lighting submitted in competition for the gold medals offered by the Society in December, 1886, has now been published. The Jurors were Dr. Hopkinson, Professor Kennedy, and Mr. Beauchamp Tower; and they had three gas-engines submitted to their examination—namely, a Crossley 9 H.P., a Griffin 8 H.P., and an Atkinson 6 H.P. nominal. In the conditions of entry, the points regarded as most important were regularity of speed under varying loads; regularity of speed during the different stages of one revolution, or one cycle of revolutions; power of varying speed automatically to suit arc lights; noiselessness; first cost; cost of running; and cost of maintenance. Due consideration was also to be paid to the characteristics of the different motors. The tests have been very exhaustive; and we shall publish the principal data given in the report, which is voluminous and well illustrated with diagrams, &c. The Jurors do not distinguish between the comparative excellencies of the moters; but that all are regarded as equally good may be inferred from the fact, already announced, that all three engines, as well as the steam-engine submitted by Messrs. Davey, Paxman, and Co., have been held worthy of the award of a gold medal. It is satisfactory to learn that if people want electric lights, there is plenty of choice among good gas-engines suitable for driving dynamos.

The report of the Directors of the Brighton and Hove Electric Light Company, with some accounts of the working of the undertaking during the past year (the third of the Company's active existence), has been issued; and it is stated that sufficient profit has been made to enable the payment of a dividend of £5 per cent. on the share capital, by drawing a little on the accumulated profit balance. The gross profit, after writing off what is described as an "ample sum" for depreciation, is £532 for the year, whereas the dividend takes £574. It is stated that the Company's business has steadily increased during the year; and that their mains now extend to a total length of 25 miles. The supply in December was equal to 5500 lamps of 10-candle power, showing 41 per cent. increase for the year. The supply is at present by means of overhead wires; but the Company are applying for a Provisional Order, which will entail putting the cables underground.

Electric Lighting at the Houses of Parliament.—A small steam-engine and dynamo capable of working about 120 extra electric lights have been erected at the Houses of Parliament; thus increasing the total number in the building to 620. It is believed that after Easter the light will be extended to the Commons' lobby, St. Stephen's Hall, the offices immediately adjoining the House, and several of the Ministers' and reporters' rooms.

Water Supply in Japan.—The water-supply of Tokio (Japan) is, says the *Indian Engineer*, by the wooden water-pipe system, which has been in existence upwards of 200 years, furnishing at present a daily supply of from 25 to 30 million gallons of water. There are several types of water-pipes in use; the principal class being built up with planks, square, and secured together by frames surrounding them at close intervals. The pipes less than 6 inches in diameter consist of bored logs, and somewhat larger ones are made by placing a cap on the top of a log in which a very large groove has been cut. All the connections are made by chamfered joints, and cracks are caulked with an inner fibrous bark. Square boxes are used in various places to regulate the uniformity of the flow of water, which is rather rapid, for the purpose of preventing aquatic growth. The water is not delivered to the houses, but to reservoirs on the sides of streets, nearly 15,000 in number.

Notes.

Dangerous Petroleum.

In a communication to the *American Chemical Journal* upon the subject of dangerous petroleum-lamps, it is remarked that many modern oil-lamps heat their reservoirs to temperatures above the legal flashing-point, and are consequently very dangerous in use. In many commercial kerosenes, the lowness of the flashing-point is due to the presence of only small quantities of paraffin with low boiling-points; the proportion of these components being too small to produce a really dangerous explosion. By making mixtures of these hydrocarbons with air, the authors have determined the fact that all the paraffins up to and including octane form at ordinary temperatures gaseous mixtures that can be exploded. Mixtures containing nonane explode at 79° Fahr., and those with decane at 104° Fahr.; so that both or either of these hydrocarbons are capable of dangerously lowering the flashing-point. Even with oils of high flashing-point, the addition of small quantities of any of the lower paraffins (heptane, hexane, &c.) causes a considerable reduction of the flashing-point. Consequently, an oil may be condemned as altogether dangerous merely on account of the presence of a small and really insignificant proportion of a highly volatile paraffin. As a possible means of freeing commercial oil from these undesirable constituents, it is suggested that a current of air should be drawn through the oil for some time. The low-boiling portions are in this way removed, and the flashing-point is raised. A small loss of weight necessarily accompanies this improvement of the bulk of the oil; but as the low-boiling paraffins are usually present in very small amounts, the loss should be scarcely appreciable, some of them being found only as traces in an ordinary illuminating oil.

Perret's Dust Furnaces.

A recent issue of the *Engineer* contains an illustrated description of the application, by Messrs. Bryan Donkin and Co., of the Perret dust-burning furnace to a Lancashire boiler, The Perret system has been described in the Journal, and it will therefore be sufficient now to state that it consists in the employment of very thin deep fire-bars, the lower edges of which dip in water to keep them cool, and so prevent the adhesion of clinker while the fuel is burnt upon them by a forced blast from a fan. It is stated that up to May last Messrs. Donkin and Co. had fitted the system to 67 boilers with 103 grates; the larger number being Cornish and Lancashire boilers. Of these 23 were in gas-works, where they are successfully burning pan breeze which otherwise hardly pays for carting away. The special recommendation of this process is that it not only burns an otherwise almost valueless fuel, but does so to such good effect, and with so much energy, that boilers fitted with it steam as well as when fired with better fuel in the ordinary manner. This is an important point for steam-users, for otherwise it would be often impossible to employ a cheap fuel if it did not make steam fast enough. The comparative evaporative duties of various dust fuels in common use have been determined as follows:—Ordinary breeze from London gas-works, 5·1 lbs. of water per pound; equal weight of breeze and coal dust, 5·8 lbs. of water per pound of fuel; coal dust, 7·6 lbs.; and Welsh steam coal dust, 7·1 lbs. Professor Kennedy has conducted a trial of the system in which 9·9 lbs. of water were evaporated from and at 212° Fahr. per pound of dust from Nixon's Navigation Coal.

The Permeability of Cement Mortar.

Mr. James B. Francis has communicated to the American Society of Civil Engineers the results of experiments undertaken by him to determine whether water pressure can be transmitted through the capillary channels in cement mortar as built into tank walls. The apparatus employed for this purpose consisted of a cast-iron reducer pipe, from 8 to 6 inch bore, which was packed with the mortar to be tested. A connection with a high-pressure water supply was made at one end of the pipe, and there was an escape valve at the other. The normal pressure of the water was 77 lbs. The mortar was composed of one part of cement to two parts of sharp sand, allowed to set 7 days in air and 21 days in water; afterwards being dried for 7 days in the air. It was then steeped a second time in water for 7 days, after which it was taken out, allowed to dry, and considered fit for the experiment. The block was 15·84 inches thick. The result of numerous observations was to show that there was considerable percolation of water through the mortar under the pressure stated; although it diminished after a time, when the pores of the material became choked with the sediment from the water. Although the experiments were admittedly upon a small scale and with defective apparatus, Mr. Francis thinks he is justified in concluding from them that pressure can be transmitted through hardened mortar composed of one part of Portland cement to two parts of sand, and that there is sufficient percolation of water under pressure through such mortar to saturate any wall of which it may be a component. Mr. Francis thinks that a wall can be made more impervious by a plastering of pure cement on the face next to the water than by any thickness of mortar as ordinarily laid.

The Aqua-Ammonia Engine.

Mr. Edward E. Magovern has read a paper before the American Society of Civil Engineers on the theory of aqua-ammonia engines; giving results of tests of an engine of this type supplying power to an Edison electric lighting installation. Mr. Magovern examines the question of the utilization of the heat of coal for the production of motive power through the intermediary of water; and

considers the theoretical possibility of saving some of the admitted 90 per cent. of loss, by the employment of some liquid having a lower latent heat of vapourization. He recognizes the fact that authorities on the steam-engine have stated that one vapour is as good for expansion as another—practical considerations apart; but he objects to the inference that therefore water cannot be usefully displaced by something which has a better capacity for receiving heat. His position is that ammonia gas is readily absorbed by water, and held in it mechanically. Therefore the least application of heat causes the discharge of the gas, which has no latent heat of gasification, never having become liquid, and may be easily utilized in motor engines. The plant described in the paper comprises a single cylinder Porter-Allen automatic cut-off engine, a horizontal return-tube boiler, and condensing apparatus for causing the re-absorption of the exhaust vapour and eventually returning it to the boiler. Full particulars of the plant, which embraces several novel features, are given in the Transactions of the Society. From the detailed report, it appears that with a boiler capable of supplying an engine with steam only for 32·26 horse power, it was found possible, through the substitution of ammonia, to supply vapour for developing 58·14 horse power at a lower rate of combustion. Also, in an engine of modern type, requiring 5·626 lbs. of coal per horse power when working with steam, the fuel consumption fell to 2·974 lbs. of coal per hour (or more than 53 per cent.) when working with ammonia. Neither the engine nor the boiler was particularly good of its kind.

Communicated Articles.

ON RECENT PROGRESS IN THE PURIFICATION OF COAL GAS FROM SULPHUR COMPOUNDS.

By H. Leicester Greville, F.I.C., F.C.S.,
Chemist to the Commercial Gas Company.

Concluded from p. 336.)

The second on my list of processes of sulphur purification is that recently advocated by Mr. W. A. Valon—viz., by the use of oxygen.* In this method, by admitting a small percentage of oxygen with the crude gas entering the lime purifiers, the remarkable result was obtained of the simultaneous removal of carbonic acid, sulphuretted hydrogen, and carbon disulphide. In the experiments conducted at the Westgate-on-Sea Gas-Works, by the use of lime with a proportion of 0·1 per cent. of oxygen, for every 100 grains of sulphuretted hydrogen present per 100 cubic feet of gas, carbonic acid and sulphuretted hydrogen were removed, and the "sulphur compounds other than sulphuretted hydrogen" reduced to something between 6 and 8 grains per 100 cubic feet. This is actually an almost total abstraction of carbon disulphide; but there is reason to assume that the relation of area of purifiers to make of gas was more favourable to complete purification than is usually the case at larger works. However, even making allowance for this, the result is a remarkable one. To demonstrate the superiority of this process over the ordinary method, two things are necessary—viz., in the first place to prove that the process is equally efficacious when used with a due regard to the relation between area and velocity existing in the larger gas-works; and, secondly, an absolute statement, founded on practical experience, of the comparative costs of oxygen on the one hand, and of the ordinary method of purification on the other. I am quite aware that Mr. Valon has already given his opinion on the last named point; but the question will be better answered when we are in possession of details, founded on the manufacture of oxygen by the Brin process on the works where the product is used, and where the gas manager will be in absolute possession, not only of the results obtainable in purification by the use of this process, but also of the cost of obtaining the oxygen under the most economical conditions.

Of Mr. Methven's method of purification by the use of air there are not, as far as I am aware, any published details; but, to the best of my knowledge, he has effected sulphur purification by the use of lime, contingently with the removal of carbonic acid and sulphuretted hydrogen from the crude gas, by the introduction of a regulated quantity of air, in the same way that Mr. Valon has employed a regulated quantity of oxygen, and this on a continuous and practical scale, and with the same plant as was previously used for the ordinary system.†

Before leaving this branch of the subject, it would be unfair not to place on record the fact that Mr. R. Harris, when in charge of the Bow Common Gas-Works, was really the pioneer of the use of air as a means of rendering lime available for the reduction of "sulphur compounds" in gas. To the best of my remembrance, the gas from the Bow Common works for many years contained the lowest proportion of "sulphur" of any gas then supplied; and this result was obtained by a rotation of lime vessels which were changed for sulphur only, and therefore in a condition in which the carbonating and sulphiding were only partial. The contents of the purifier, after being turned out and exposed to the air, were replaced in the vessel, which was then (to the best of my recollection) used last in the series.

With regard to the chemistry involved in the various systems where lime is employed as an agent for removing carbon disulphide, I consider that in the ordinary method of sulphiding, the active agent is hydrated calcium sulphide, which, by union with carbon disulphide, forms calcium sulphocarbonate; but that, in all cases where air or oxygen is employed, the active material is one of the higher calcium sulphides, which forms a special compound with carbon disulphide, accompanied with (in all cases where a higher proportion of sulphur is present than is represented by the formula $Ca\,S_2$) a separation of free sulphur, with formation of the $Ca\,S_2\,CS_2$. According to my experience, all these higher calcium sulphides are more active in absorbing carbon disulphide than the ordinary hydrated monosulphide—a fact which has a practical bearing on ordinary purification in affecting the purifier area necessary to accomplish a definite result.

The fourth on the list of processes of sulphur purification—viz., the Claus system—is a most interesting development of ideas of which the germs can be traced back for a considerable period. I do not propose to discuss here the method in its entirety, but simply in its application to the elimination of carbon disulphide from gas. The first attempt to utilize gas liquor for sulphur purification was, as far as I am aware, that of the late Mr. J. Leigh, of Manchester, whose patent dates back as far as 1866, and whose process was used successfully at the Manchester Gas-Works. No further allusion need be made to his process beyond stating that, partly by concentration of gas liquor by distillation, and partly by filtering it through foul lime, he succeeded in obtaining a solution of ammonium sulphide which was active on sulphur compounds. The explanation of his success is no doubt to be found in the fact that, by the exposure of his fouled lime and his concentrated liquor to the atmosphere during their treatment, there were formed a certain quantity of the higher sulphides of ammonium which are now known to combine actively with carbon disulphide.

With reference to the portion of the Claus process directed to the extraction from gas of the last-named impurity, I may allude to an article by Mr. C. W. Heaton, published in the Journal for July 26, 1887 (p. 197), in which he alludes specially to the chemical reactions involved in the use of the process; and to these I propose to refer. In this process, the gas is brought into intimate contact with a solution of the polysulphides of ammonium produced by adding sulphur to specially-prepared ammonium sulphydrate obtained from distilling and treating ordinary gas liquor. Mr. Heaton gives the following formula for the reaction:—

$$N\,H_4\,HS + N\,H_3 + S = (N\,H_4)_2\,S_2$$

and the subsequent reaction with carbon disulphide, so as to form sulphocarbonate, as follows:—

$$(N\,H_4)_2\,S_2 + C\,S_2 = (N\,H_4)_2\,S_3 + S$$

The separated sulphur is dealt with by being kept within moderate limits, in proportion to the amount of liquid; and, according to Mr. Heaton, it eventually passes into ammonium sulphocyanide by contact with ammonia and hydrocyanic acid; thus—

$$N\,H_3 + H\,C\,N + S = N\,H_4\,C\,N\,S.$$

It is found in practice that the activity of polysulphide of ammonium is much increased by the presence of free ammonia and ammonium sulphydrate. Mr. Heaton offers the most reasonable explanation of this by assuming that the sulphur, set free by the reaction of CS_2 and $(NH_4)_2\,S_3$, passes, in the presence of the ammonia and ammonium sulphydrate, into a fresh portion of $(NH_4)_2\,S_3$; and so the action extends. The process appears to accomplish the long-desired object of purification in closed vessels, and this together with the most ingenious utilization of the bye-products.

Of Messrs. Hood and Salamon's scheme little need be said, as, to the best of my knowledge, no further information on the projected process has been given since the publication of the paper read by these gentlemen before the Society of Chemical Industry in January last year.* The proposal of these two gentlemen was to supply a product from bleach-works known as "Weldon mud"—a mixture of the hydrated oxides of lime and manganese, having the general formula $CaO\,MnO\,(MnO_3)$. It is associated with a certain amount of calcium chloride, which has to be removed by washing before the material is fitted for gas purification purposes. It is claimed for the washed product that it will absorb both carbonic acid and sulphuretted hydrogen, and further that the manganese sulphide formed unites with carbon disulphide. If this reaction really occurs, it would be a curious one, as the sulphide of an analogous metal—viz., iron—is present in large quantities in the ordinary process of gas purification, and is not known to exercise any perceptible influence on the sulphur compounds.

The last on the list of recent proposals for the elimination of carbon disulphide from coal gas is, I consider, a very interesting one, and was ably advocated in a paper read by Mr. W. Young before the North British Association of Gas Managers on July 21, 1887.† Mr. Young's proposed method is founded on the fact that shale oils, as well as the heavier portions of coal-tar naphtha, are capable of abstracting the vapour of carbon disulphide from gases containing them. Further, it is quite within the region of possibility that such liquid hydrocarbons would also possess a capacity of absorbing those more complex and less known sulphur compounds in coal gas which are always more or less present, and which thus far, have not been removable by any known method. In my opinion, the great drawback to the adoption of a method of sulphur purification founded upon the employment of liquid

* See Journal, Vol. LI., pp. 330, 1174.
† In this connection, see a letter from Mr. Methven in our "Correspondence" columns to-day.—Ed. J. G. L.

* See Journal, Vol. LI., p. 64; also pp. 110, 153.
† See Journal, Vol. L., pp. 202, 212.

hydrocarbons of comparatively high boiling points, lies in the fact that such liquids do not possess the property common to all other practical absorbents of carbon disulphide—viz., that of forming a definite chemical compound, and therefore of differentiating between sulphur compounds and other substances present in the gas. In other words, while solid and liquid polysulphides simply perform the function of abstracting carbon disulphide from gas, liquid hydrocarbons would more or less abstract the vapours of all substances possessing a lower boiling point than themselves. Ordinary coal gas passed through a heavy hydrocarbon oil not only loses the vapour of carbon disulphide, but also a large proportion of the vapours of volatile hydrocarbons, such as benzol, &c., to which, to a large extent, the gas owes its illuminating value. I have, in fact, by passing gas through a small coke scrubber in which the coke has been previously soaked in heavy hydrocarbon oil, reduced the illuminating power of the gas from 17 to 8 candles. We are therefore confronted with the problem of how to utilize the capacity of heavy liquid hydrocarbons for absorbing sulphur compounds without at the same time sacrificing the lighting value of the gas. The solution of this problem would be found in a process by which the heavy hydrocarbons, after saturation, could be treated so as to eliminate the carbon disulphide, but to return the benzols, &c., to the gas, in order to restore the lost illuminating power. I look upon such a process as quite within the bounds of possibility; and a development of the future may yet be founded on these lines, with pure liquid carbon disulphide as a bye-product.

Finally, I trust that the object of the present article—viz., that of presenting in a compact form what suggestions have been recently made with regard to sulphur purification—has been fulfilled. One of the characteristics of the present age is that a large amount of mental food is being constantly presented to the human organism for absorption; and, like the medicinal doses of our youth, we are more or less bound to swallow it, even if, after mastication and deglutition, it is incapable of digestion. Such food has a better chance of doing good when presented in a condition in which it is readily absorbable; and that is the task which I have endeavoured to perform.

THE CHEMISTRY OF ILLUMINATING GAS.

By Norton H. Humphrys, Assoc. M. Inst. C.E., F.C.S.

IX.

It has been the fashion lately to publish chronologies of events possessing a claim on public interest. Any table of this kind having reference to the gas industry is incomplete if it does not put special emphasis upon the 10th of January, 1854. A few extracts from some remarks made by Dr. Letheby at a meeting of the London Court of Sewers held that day,* will explain the reason for this remark:—

In valuating statements with regard to the quality of the gas, I shall be doing you and the public good service, for in the course of the investigation which I have been making during the last two years, I have found that some of the Companies are supplying gas to the Metropolis which, in the course of a few years, must tend very much to damage property and deteriorate the atmosphere; for it is so highly charged with carbon disulphide that I have been able to obtain as much as 21 grains of oil of vitriol from 100 cubic feet, and this deleterious acid is getting into the atmosphere. Then, again, there is an enormous quantity of ammonia which holds in solution a large quantity of tar; and this oozes out wherever there is a leakage in the pipes, so that during the last 50 years the mud and soil of the public streets have become so impregnated with it that it is quite offensive to move the pavements. What it will be in the next 20 or 25 years, I cannot say; but I am inclined to believe that it will then be unsafe to touch the pavements at all. I therefore think that I do not go out of my path when I report to you that some of the Companies—naming them too—are supplying gas which is thus highly charged with these poisonous compounds.

Mr. Hall: You say, Sir, that some of the gas is very highly charged with oil of vitriol. Has not that a tendency to injure furniture?

Dr. Letheby: Certainly; and there is not a library in the Metropolis, the books on the upper shelves of which are not tumbling to pieces from this cause.

Mr. Elliott: It is very evident that there is a great deal of gas burned in the Metropolis of a very injurious nature to furniture and books. I should be glad if Dr. Letheby would inform us also if the combustion of gas of this nature, so largely charged with sulphur and oxygen—to say nothing of ammonia—and which he tells us is so hurtful to delicate manufactured fabrics, is not far more hurtful to the lungs and windpipes of human beings who inhale it. Whether the health of persons shut up in rooms and shops, where such gas is burned, is not likely to be very much impaired thereby?

Dr. Letheby: I have no hesitation in saying that whatever is injurious to inert matter is likely to be far more destructive to living beings.

Mr. Hall: No doubt that is the reason why bronchitis is more prevalent now than formerly.

Dr. Letheby: I have lately been examining the snow that has been falling around London; and I find it is highly charged with sulphuric acid. The leaves of trees also are in the same condition. It is sometimes found in combination with ammonia, and sometimes in a free state, so that you cannot get a pure atmosphere.

Deputy Godson hoped these statements would reach the public through the medium of the press, and be the means of saving property and prolonging life.

The substance of this conversation was literally accepted by the public, and commented upon by *The Times* and other daily papers as representing absolute facts. The need for instant action, to guard against "the subtle poison admitted to the atmosphere and to the very ground we tread on" was strongly insisted upon, The desirability of enclosing gas-mains in brick tunnels, in order to keep the poisonous exhalations from percolating into the soil, was gravely discussed. And thus commenced, in a characteristic manner, the public movement known as the "Sulphur Question." How far it has been productive of benefit to the public is a matter of opinion. It is certain that the expense entailed upon them, through the medium of the Gas Companies, as represented by the cost of extra purification, of continual testing and reporting, of parliamentary inquiries, &c., &c., must have been enormous. The terrific spectre thus invoked by Dr. Letheby continued to haunt the public mind for many years; but it has now been effectually laid to rest, with the exception of a little mild exorcism in the shape of periodical tests by the Gas Examiners. The entire fallacy of the charges made by Dr. Letheby against coal gas, has been exposed by the best of all tests—the test of time.

The Journal of Gas Lighting at once recognized the uncalled-for and unjustifiable injury inflicted upon the gas industry by public statements such as those above quoted, and dealt in a vigorous manner with the real facts,* pointing out that the sulphur produced by the combustion of coal gas was a mere trifle as compared with that evolved from coal and coke. The fuel used in the Metropolis alone was estimated as 3½ million tons of coal, and 300,000 tons of coke per annum. This would discharge into the atmosphere not less than 55,000 tons of sulphur, or 166,500 tons of oil of vitriol. If Dr. Letheby's estimate be accepted, the quantity of sulphur evolved from coal gas would be 1200 tons per annum, considerably less than 1 per cent. of the total. Yet the Legislature stand in the illogical position, that they have made special enactments for dealing with the 1 per cent. of sulphur from coal-gas, while the bulk as evolved from coals and coke—from our domestic fireplaces, steam-boilers, and locomotives—is not limited in any way. It is therefore a gross injustice to quote particulars of experiments on snow, &c., in proof of the alleged deleterious qualities of the products of combustion from coal gas; as is also the case with regard to the expression "highly charged" as applied to these sulphur compounds. The 21 grains of oil of vitriol obtained by Dr. Letheby would represent about 7 grains of sulphur per 100 cubic feet of gas. The weight of this gas would be 22,000 to 24,000 grains, from which it appears that the ingredient with which the gas was alleged to be highly charged, really existed only in the almost ridiculous proportion of one part in 3200. The very minute proportion of sulphur produced by the combustion of coal gas may further be illustrated by referring to the example cited when considering the effects of the products on the air of an ordinary apartment—viz., three burners using 15 cubic feet per hour in an apartment 15 ft. × 15 ft. × 12 ft. high. The 15 cubic feet would in that period evolve about one grain of sulphur, either in the form of sulphurous or sulphuric acid. For the sake of argument, we will call it the latter; although the formation of it by an ordinary gas-burner has never been proved. If we desire to obtain the sulphur in the form of sulphuric acid, special apparatus and conditions altogether different from those obtaining with ordinary gas lights must be introduced. But it has been shown that the atmosphere in the room must be completely changed every half hour at least, if the products of combustion are allowed to escape freely into it. It follows that in a properly ventilated room, the sulphur present at any one time will not exceed 2 grains. This very small quantity is diffused throughout the whole contents, 2700 cubic feet; and would represent about 0·6 grain of sulphur per 100 cubic feet of air, or say six parts in a million. So far it has been assumed that the air is perfectly free from sulphur from other sources. But, as a matter of fact, this substance is always present in the air of towns, as may be seen by referring to the researches of Dr. Angus Smith and others. In many manufacturing towns the air is charged to a much larger extent than that above named, as in addition to the combustion of large quantities of coal, sulphurous acid is a waste product in certain chemical processes that are conducted on a very large scale. Taking all these facts into consideration, it is evident that no impartial observer would charge coal gas as being the source of the sulphur that is found in the atmosphere.

In a lecture to which allusion has already been made, Dr. Odling deals in a plain straightforward way with the production of sulphur acids by the combustion of coal gas.† He very aptly remarks that the results obtained with the apparatus known as the "sulphur" test in no way illustrate the form in which the sulphur is evolved from an ordinary burner, because a special kind of burner is used under special conditions; and he shows that under ordinary conditions the air of an apartment cannot become charged with sulphurous acid to the extent of more than one part in half a million, without at the same time being too highly charged with carbonic acid and moisture to be breathed in comfort. Dr. Letheby took part in the subsequent discussion; and gave a long list of the injuries supposed to be due to sulphur in gas. It was evident, from the context of his remarks, that the instances on which his opinion was based were, without exception, also instances of improper ventilation, or indeed of no ventilation at all. How far the rotting of leather or of textile fabrics, to which he refers, is due to sulphur, is therefore an open question. And we might add, supposing the corrosive action of the sulphur acids to be proved, there was nothing to show how much of it came from the gas, or from other sources. One remarkable statement made by Dr. Letheby was on the effect of gas as regards plants. He said that they were peculiarly susceptible of injury from the presence of sulphurous acid in the air. According to Drs. Turner and Christison, as little as one part in 10,000 of air will kill plants in less than 24 hours. If this is correct, how is it that plants will

* See Journal, Vol. III., p. 348.

* See Journal, Vol. III., p. 339. † *Ibid*, Vol. XVIII., p. 83.

live at all in our chief towns? As we have seen, by the time that a proportion of only one part of sulphur in 10,000 was obtained, about one part in ten of the other products would be present; and the amount of oxygen in the air would be reduced one-half. The atmosphere would be poisonous to living beings, and therefore might well be injurious to plants, apart from all considerations as to sulphur. This remark of Dr. Letheby's, however, is the only attempt I have met with to account for the poisonous action on plant life with which the products of combustion from coal gas are popularly credited. Certain loose statements as to imperfectly consumed products of combustion, &c., have certainly been made; but they are not supported by experiments. The most reasonable way of accounting for the effect, is to ascribe it to heat and dryness of the air, due to want of ventilation. Many others as well as the writer would be able to testify, from practical experience, that where proper care as to ventilation is observed, plants are not prejudiced in any way by the use of gas in the rooms in which they are kept.

A report on the sulphur question was prepared by Mr. Barlow and M. Ellissen, Chemist to the Paris Gas Company in 1864,* from which it appears that at that time the London gas usually contained from 20 to 25 grains of sulphur per 100 cubic feet, which was in excess of that obtaining in other cities. Paris, Newcastle-on-Tyne, and Nottingham are cited as examples of places where the quantity was very much lower. An important feature of this report is the statement that the sulphur compounds are not confined to gas alone, as is popularly supposed, even at the present day. The weight of 100 cubic feet of gas is from 3 to 3½ lbs.; and in most towns the proportion of sulphur is now kept at 10 grains or less per 100 cubic feet. One pound of gas would produce, therefore, about 3 grains. M. Ellissen states that 1 lb. of stearine or spermaceti candles contains ⅜ grain of sulphur; and an equal weight of purified colza oil contains about 1½ grains. If such is the case with these substances, which are amongst the purest of the solid and liquid artificial-light agents, what are we to expect from the cheaper fats and oils that are used?

The Wenham Company's German Patent.—Some time ago, Mr. F. Siemens took legal proceedings in Germany for the annulment of the Wenham Company's patent for that country, upon various grounds, including anticipation; but the result was a verdict in the Company's favour. Mr. Siemens appealed from this decision; and the case has recently been heard before the Supreme Court at Leipzig, with the result that it has been dismissed, and the decision in the Court below upheld.

Laying a Water-Main across a Thousand Feet Stream.—The city of Vancouver, British Columbia, is (says the *Scientific American*) soon to have a high-pressure water system, with a supply derived from the River Capilano, a precipitous stream taking its rise in the snow-capped mountains of the Coast Range of British Columbia. A submerged water-main, 1100 feet in length, with flexible joints, has been laid across Burrard inlet; being part of the main line of the water-works. The manner of laying, and the appliances were somewhat novel. A skidway of fir logs was built in a trench on the shore, reaching 1200 feet back from the water's edge. The whole line of 1100 feet was then made up on the skidway with Ward's flexible sockets. Three cables were then attached—one at each end, and one at the middle; the forward and middle cables being carried across the stream and attached to the drums of separate engines. The cable from the rear end was attached to an engine drum at the water's edge, on the same side of the stream, and floats were provided for partially buoying the pipe, and lashed to it as it entered the water. The weight of the whole length of pipe, including lead joints, was 55½ tons; the three engines having an aggregate of 130-horse power. With this arrangement the pipe was drawn steadily and safely to its place without accident, and was examined for its whole length by a diver, who cut the buoys loose.

Water Supply in New Countries.—The little book recently published by Mr. T. W. Stone, Assoc. M. Inst. C.E., on the above subject—a copy of which, as notified last week, has been forwarded to us by the publishers (Messrs. E. and F. N. Spon)—has been written with the special object of assisting those engineers who are about to undertake the construction of water-works in countries where these concomitants of advanced civilization have been wanting. As the author has filled the position of Resident District Engineer for Water Supply to the Victorian Government, he is eminently qualified to give advice on the subject dealt with. He points out that constructive works of a far more expensive character than are needed, or are warranted by the population of the countries where they are undertaken, are often carried out, owing to inability on the part of their projectors and designers to properly estimate the quantity of rainfall actually available. By the perusal of Mr. Stone's book, engineers who are likely to be called upon to advise on the subject of water-works in undeveloped countries will obtain much useful information which may save themselves trouble and their clients expense. The text is clearly and concisely written; and it is illustrated by eighteen well-executed lithographed drawings to scale, with dimensions, and a schedule of prices. To water-works engineers generally the book will be useful; but to those who are thinking of leaving England to seek their fortune in the New World, it will be of peculiar value.

* See Journal, Vol. XIII., p. 713.

Technical Record.

MIDLAND ASSOCIATION OF GAS MANAGERS.

The Twelfth Annual Meeting of this Association was held at the Grand Hotel, Birmingham, on Thursday last, under the presidency of Mr. Charles Taylor, Engineer of the Derby Gas-Works. There was a large attendance of members; and much interest was evinced in the proceedings, an extended report of which will appear in due course. Meanwhile, it may be stated that the minutes of the previous meeting having been read by the Honorary Secretary (Mr. J. S. Reeves, of Bilston) and confirmed, the following report, accompanied by an abstract of the accounts, was presented and adopted:—

Your Committee have pleasure in submitting the following report for the past year:—

At the annual meeting held on Feb. 16, 1888, the President, Mr. Henry Hack (Birmingham), delivered his second Inaugural Address, in which, among other matters, he suggested the desirability of appointing Special Committees in connection with ours and kindred Associations, to investigate and report upon new processes, inventions, and other important matters appertaining to the gas industry. He also pointed out other means whereby gas companies, and other owners of gas undertakings, might, in his opinion, promote "inquiry and research." A review of the Board of Trade returns since 1882, and the effect of the "sliding scale" upon gas undertakings, formed important features of the address. The progess of electric lighting and the commission topic were also referred to. Generally, the address contained many points of interest, and was well received by the members. At this meeting the attention of the members was called to an automatic prepayment gas-meter, which was exhibited by the patentee, Mr. R. W. Brownhills, who, upon the call of the President, kindly explained its action, and freely answered the various inquiries put to him respecting it. Through the kindness of Messrs. Thomas Piggott and Co., the members were permitted to visit their works at Spring Hill, Birmingham, and witness a patented and very successful process of welding large steel and wrought-iron tubes by means of gas, in which, as "gas makers," all the members appeared much interested.

The spring meeting was held May 17, at the offices of the City of Bath Gas Company. The Association was well represented; and a most cordial welcome was accorded the members by the Deputy-Chairman, the Engineer (Mr. C. S. Ellery), the Secretary, and other officials of the Bath Gas Company. An inspection of the works was made, after which the Engineer read an instructive paper on "Notes in the Retort-House;" the paper being closely listened to, and freely discussed. The members were afterwards conveyed in carriages through some of the principal parts of the city and its suburbs, the most attractive features being pointed out. The members were also conducted over the splendid suite of baths, including those in course of erection, which, when completed, will rank among the finest of the kind in Europe. An inspection was afterwards made of the exceptionally interesting Roman remains, and the Grand Pump Room. Subsequently, upon the kind invitation of the Directors of the Bath Gas Company, the members and some friends dined together at the Christopher Hotel, and a very enjoyable evening was spent. The day's proceedings may be looked back upon as among the most profitable and enjoyable recorded in the annals of the Association. The autumnal meeting was held Oct. 18, at the Grand Hotel, Birmingham. Mr. Lewis's paper, on "The Competition of Oil with Gas" was discussed. Mr. C. Taylor read a brief but instructive paper on an oft-repeated question, "Are High Carbonizing Temperatures Convenient and Profitable?" Through want of time, the discussion of this paper was adjourned.

The election of Officers was then proceeded with, and Mr. Charles Taylor, of Derby, was unanimously elected President of the Association for the ensuing year. Mr. P. Simpson, of Rugby, was re-elected Treasurer. Mr. W. R. Cooper, of Banbury, having with regret expressed his inability to again accept the office of Honorary Secretary if re-elected, Mr. J. S. Reeves, of Bilston, was elected to that position. The other appointments made were—

Members of Committee . . Messrs. W. R. Cooper, W. Littlewood, and J. F. Bell.
Auditors . . . . . Messrs. W. T. Tew and J. T. Lewis.

The Committee deeply regret to record the loss by death of one of its members, Mr. Collett, of Dudley. Four new members have been elected during the year, and one member has withdrawn; the number on the books now being 61. The average attendance at the meetings is 25.

The Committee trust that the interest shown by the members generally in the work of the Association will continue unabated, that there will be no lack of papers for the forthcoming meetings, and that the average attendance thereat will not only be equal to, but surpass that of former years.

The President then read the following

INAUGURAL ADDRESS.

Gentlemen,—Permit me to again thank you for the distinguished honour you have conferred upon me in electing me as your President for the year. I have been scarcely so ambitious as to expect that I should be called upon by your invitation and vote to assume a position at the head of this Association, which is at once honourable and responsible. I can only say that I will give my best efforts to deserve the confidence you have reposed in me, and to promote the interests and dignity of the Association as far as lies in my power.

It is a very necessary and proper custom which demands that the President of an Association such as ours shall inaugurate his term of office by addressing members upon the various subjects affecting not only the well-being of the Association itself, but also the prosperity and well-being of the interests which the Association represents.

The unfortunate departures of one or two members of our profession from the paths of probity and honour, and the systematic manner in which they have abused the confidences reposed in them, have very naturally led Gas Committees and Directors to investigate whether the interests under their charge are subjected by their officers to similarly dishonest treatment; and in doing so, checks have been formulated and adopted, not as I am happy o believe, in the great majority of instances, because of any

suspected dishonesty on the part of servants, but to fulfil the duty such Committees and Directors owe alike to shareholder and gas consumer, and to satisfy them that all that is possible is done to prevent similar scandal and fraud. In these investigations, no doubt, there have been instances of unjust treatment of officers; and gentlemen of honour and integrity have been made to suffer in common with men who have deserved no less —who take

> "Their licence in the fields of time,
> Unfettered by the sense of crime,
> To whom a conscience never wakes."

Born in sin and shapen in iniquity, human nature in the aggregate is no better than it should be; and, without indulging in dishonouring reflections, we may admit that whatever positions in life men may occupy, there may be very few indeed in the sight of God who would not have entered Heaven the purer, "could they have put off their body with their little coat." We who have been permitted to live up from that "best copy of Adam before the Fall," have been taught the necessities of progress and independence; and having regard to the school and the teaching, such of us as have passed the curriculum of temptation without defilement in our business transactions may well enjoy the repose and dignity—the *otium cum dignitate*—of a clear conscience, and may the more calmly "breast the blows of circumstance."

It is to professional men, and to Associations such as ours, that our respective employers and the public at large have mainly to look for the scientific, practical, and economical advancement of gas manufacture; and it is our duty, as it is our interest, to press forward with a royal fidelity towards the developments we know are possible, and may be relied upon in the future for the maintenance and continuance of our staple supply, in face of all rivals. When President of the National Association for the Promotion of Social Science, in the year 1876, Mr. Thomas Hawksley, addressing the Health Section, said that could the then existing rate of increase in population continue through twenty generations (418 years), the aggregate number of persons would become more than fifteen worlds would contain, each as densely populated as our globe is at present. If we feel any concern for the well-being of those who generations later may be left to fight the battle of life—if we feel any gratitude towards those who in the past strove to make the world better than they found it, and did so much to free us from the trammels of ignorance and superstition—we, as reciprocals of the past and future, can neglect no consideration which may render us worthy of the period in which we live. In the struggle for existence, scientific development must remain the correlative of prevailing necessity; and, using the words of Mr. Lewis T. Wright, as "the fountains of knowledge are too infinite to ever fail," we may rely upon them to supply the perennial needs of life.

I agree with Mr. Hack that there can be nothing but gain in educating the rank and file of our fellow-creatures; and that to increase the intelligence of the workman under our direction, is to improve his moral tone, and make him a more valuable coadjutor in applying principles to practice. The opportunities afforded for the acquirement of information are already very great; and no doubt those who possess the desire to improve their general or special knowledge need not be at a loss to find the means. Yet to the greater number, tired with daily toil, the absence of convenient opportunity remains a check upon effort; and were the employers of labour to bring the means of acquiring information nearer, a step in advance would be made. This view is held probably by our respected fellow-member, Mr. Colson, of Leicester. At the Ayleston Road works, not only are washing and bathing departments being provided, but adjoining them is a workmen's reading-room, which, for comfort and convenience, I have not seen surpassed. The room is furnished with many volumes of standard literature and reference; and the tables are freely supplied with the papers and periodicals of the day.

As it is the object of the civil engineer "to convert and apply the great sources of power in Nature for the use and convenience of man," so must the working of many minds towards a common object continue to eliminate and produce new advancements and developments. The importance of the interests involved will justify me in submitting to you the question, Is the progress of gas manufacture towards purity and economy as rapid as it should be, looking at the many chemical and other unapplied factors in our possession? Mr. Hack, our esteemed and twice-past President, in his Inaugural Address last year, made some very valuable suggestions, one of which is that, to prevent a large amount of duplicate expenditure, a Special Research Committee should be formed to investigate and report upon new processes and inventions. Another is that gas companies and corporations should form an Association and a fund for the purpose of conducting experiments in connection with the Special Research Committee and with the aid of experts. Such a fund could be further applied in offering substantial inducement, in the way of prizes, for schemes and designs for improvements in gas manufacture, to be accompanied with mathematical, chemical, and practical demonstrations of utility.

The papers read before the members of our General and Local Institutions, and the discussions upon them, do much to advance our special knowledge of the value of new ideas, processes, apparatus, and plant. May I venture to hope that the members of the Midland Association of Gas Managers will do their utmost to provide papers and notes on subjects connected with our business, so that the meetings to be held during my year of presidential office shall not lack interest.

Looking back to the year 1854, when I first commenced my official life, I am struck with the enormous advance which has been made in the progress of gas manufacture. Those were days of iron retorts, 8000 cubic feet of 10 to 14 candle gas from a ton of coal, and a charge to the consumers of generally 4s. to 8s. per 1000 cubic feet. Now, we do not rest satisfied with less than 10,000 to 10,500 cubic feet of 17 to 18 candle power gas, at a selling price of some 2s. to 3s. per 1000 feet. But with rivals in the field, we must continue to progress; and I think we all accept the proposition that coal gas can continue to be popular for lighting purposes so long only as the article is good and pure in quality and low in price.

Of the competing systems of artificial lighting, the first in order of scientific application stands that of electric incandescence. But notwithstanding the important advantages the promoters of electric lighting obtain by Lord Thurlow's Amendment Act of last session and the various improvements which have been made in the methods of supply, the system still fails to offer the advantages of cost, convenience, and continuity provided by gas. We shall, I think, have long to wait before the system can obtain anything like general adoption. Kerosene and other petroleum oils will no doubt continue to be largely used for lighting by the poorer classes of society; and it still presses upon us to consider how far gas companies and corporations should endeavour to abolish the difficulties which prevent these classes becoming consumers of gas, whether by the supply of fittings upon easy terms, the abolition of meter-rents, or by a monthly or weekly collection of payments. The very offensive smell of petroleum oils, and the troubles and dangers attending their use as lighting agents, are so many factors in our favour.

There may be some gas companies and corporations who are not endowed with the legal power to sell or hire out gas stoves and fittings, while others may doubt the propriety of entering upon this branch of business. I think, however, that where this is so, such gas companies and corporations should at least keep on view types of the best appliances both in burners and in heating and cooking stoves, and should be at all times ready to afford to consumers, or intending consumers, information as to cost and consumption. A letter of mine on this subject appeared in the JOURNAL OF GAS LIGHTING for the 17th of January, 1879; and I have seen no reason for changing the views I then held.

The annual rate of increase in the demand for gas is in some cases less than it was. Where this rate was formerly 5 to 10 per cent., it is now no more than (say) 2 to 5 per cent. This decrease is probably mainly due to the continued depression in trade we have of late years experienced. In the increasing efficiency now obtained from gas by improved burners, in the regulation of pressure at the point of consumption, in the adoption of methods of carburetting, and in improvements in the quality of gas itself may be found further reasons for the diminution of demand. So far as the electric light is concerned, I am of opinion that where it has been locally or partially adopted, it has invariably led to an increased demand for gas.

It is probable that in some few cases the state of trade, the fear of competition, and the consequently apparent necessity for economy, may have deterred directors from making needed extension to their works and plant, and which if made would have led to increased consumption. I have an instance in my recollection of this character. In the year 1883, after bringing into full operation the entirely new works I had constructed at Long Eaton, the increase in the quantity of gas consumed became 47 per cent., as against 12 per cent.—the previous rate of increase. This large accession of consumption might be due in part to an improving lace trade; but there can be no doubt that limited and inadequate works and plant must induce a limitation of supply.

This reference to extensions and new works brings me to the question of capital outlay. Having regard to the changes of methods and the improvements in plant which may be demanded from us, I am of opinion that new works should be constructed with a durability to cover a somewhat less number of years than has heretofore been the practice; and that such corporations and companies as possess the power should meet the outlay by annual redemptions out of profits. Where companies are constituted under the operation of the sliding scale, and shareholders are content with moderate dividends, they may, when the conditions are favourable, conveniently apply some portion of the surplus profits to the reduction of capital expenditure.

Looking at the arguments which have been used for the reform of Private Bill Legislation and the Local Government Act of last year, we may, I think, expect that our interests will be more or less controlled by the influence and action of County Councils. Whether this control be for good or evil, it appears to me that, in face of progress and competition, it is more than ever necessary that, as representatives of the earnings upon some £6,000,000 of capital, gas engineers and managers should be at one in purpose and action.

Although the question of regenerative firing may not, possibly, to all minds be completely solved, yet we must all admit that many very important facts have been added to our information and experience. Gentlemen who have been able to test the elaborate systems at one time advocated, have now learnt what to accept and what to avoid; and it appears to me that the result of our collective experience is that much of the complication originally proposed may be dispensed with, to the great advantage of cost and

durability, and consistently with the achievement of very considerable economy in fuel over the best of ordinary settings.

It is, I think, fully admitted that to keep gas in contact with tar during the process of cooling or condensation is to reduce its illuminating power; and that the tar should be removed from the hydraulic mains as soon as formed. I apprehend this applies with the greater force when a high temperature of carbonization is employed; and that tar delivered from the retorts with a low percentage of benzols possesses a greater valency, so to speak, for the light-giving constituents of gas than if it is delivered into the main under a low temperature of carbonization and containing a higher percentage of benzols. With a high temperature of carbonization, we are met with difficulties in removing the tar owing to its increased specific gravity and viscid or pitchy condition, and also in the formation of naphthalene. I have lately encountered instances where the inlets and outlets of station-meters have been almost completely closed with this latter deposit, and this when the yield of gas per unit of coal has been comparatively low, and has been kept long in contact with cooling tar. It would be interesting to learn from members who have admitted small quantities of air into the mains *en route* from the retorts, whether such air (by acting as a carrier) has done anything towards reducing the inconvenience. The difficulty of removing the tar will, I am satisfied, be overcome; but notwithstanding the admirable and exhaustive contribution upon the solution of the difficulty by M. Brémond (JOURNAL, Vol. XXX., p. 491), the problem of how to prevent naphthalene deposits by simple means, and without the sacrifice of yield and illuminating power, must still engage our attention. In the discussion to follow, some gentlemen present will, I trust, furnish further information on the subject.

The system of producing illuminating gas from intermediate shale oil, petroleum, &c.—as in the Avery and similar processes—does not appear to make much progress. Taking into account the liability of the apparatus to choke, wear and tear, cost of materials and manipulation, I have been unable at present to determine that any important economy over the cost of manufacturing ordinary coal gas can be derived from this method. The Dinsmore process is advertised as being capable of giving 12,254 cubic feet of 22·16-candle gas from 20 cwt. of Arley Mine Nuts and 7 gallons of tar. It remains to be proved whether these figures can be relied upon in ordinary practice, and whether the process involves the formation of naphthalene to a greater or less extent than is found in our ordinary method of working. Mr. L. T. Wright has shown that the tar produced (presumably from ordinary coal) with 10,000 cubic feet of gas per ton, gives "only 5 per cent. of substances having positive value as materials entering into chemical manipulation." If this be so, it is difficult to understand how 7 gallons of tar can be so far utilized in the Dinsmore process as to produce an increased yield of over 2000 cubic feet of gas per 20 cwt. of coal. Mr. Wright has further shown (JOURNAL, Vol. LII., p. 169) that the mixing of the richer and poorer gases during the ordinary process of coal distillation gives higher multiple results than is obtained from a single retort during an experimental test. This may in some degree account for the high results stated to be obtainable by the Dinsmore process; and I shall look with interest for further information to be obtained under a larger scale of working.

If, as has been stated in the JOURNAL OF GAS LIGHTING, and also shown by Mr. Wright, it be true that scarcely any difference from temperature is traceable in the illuminating power of gas from common coals giving the higher yields, then it must be economical to raise the make of gas per unit of weight as high as the circumstances within our control render practicable, compensating any possible strain upon the illuminating power by the use of cannels or otherwise. It is a well-accepted fact that the yield of gas per unit of coal can be considerably increased by the adoption of short charges; but this method in ordinary working involves increased cost in the form of labour. I have a growing opinion that West's stoking-machinery, as now being applied at the Blackburn Corporation Gas-Works, is well worthy of attention, as admitting the employment of short charges at a minimum of cost for machinery and labour.

The recovery of sulphur from alkali waste (JOURNAL, Vol. LI., p. 680) and from foul lime are cognate items; and I hope some member will give us a paper on these subjects. The paper read by M. de Lachomette before the Société Technique de l'Industrie du Gaz en France (JOURNAL, Vol. LII., p. 421) is worthy of re-perusal in connection with this question of the recovery of sulphur. The author proposes to dispense with the use of sulphuric acid in the manufacture of sulphate of ammonia, and to substitute sulphurous acid, to be produced by burning the sulphur from spent oxide. A current of ammonia is passed into water with an excess of gaseous sulphurous acid, forming bisulphite liquors, which, treated with a further current of ammonia, are converted into sulphite, in which form the author proposes the nitrogen shall be conveyed to the soil, there to be converted into sulphate by the oxygen of the air. In considering this process, the question occurs, Is the sulphuretted hydrogen contained in the gases from ammonia stills in too dilute or impure a form to admit of its being used in the production of sulphurous acid without the intervention of a Claus kiln.

I am not aware whether the process of purification by means of Weldon mud is making any advance. The laboratory experiments of Dr. Hood and Mr. A. G. Salamon (JOURNAL, Vol. LI., pp. 64-7) described before the Society of Chemical Industry, struck me as being of a very interesting character. If the laboratory experiments can be verified upon a working scale, the process may be valuable both for minimizing capital expenditure in purifying plant, and excluding the often serious difficulty attending the disposal of foul lime. We shall be glad to have before us the experience of any member who may have tried Weldon mud either experimentally or in a more practical manner.

I do not know whether you have any experience in the employment of ground gas-lime as mortar in building construction, but may mention that I have lately made an experiment in this direction. Having found the mortar to set as well in brickwork, and to become as hard apparently as fresh lime mortar, I conclude that a percentage of the calcium hydrate remains unacted upon by the carbonic acid of the gas. If so, and the material being cheap, we may be able to use the mortar for rough work.

The very admirable contributions from the pen of "Theory and Practice" upon the subject of gasholder construction which have lately appeared in the pages of the JOURNAL OF GAS LIGHTING, together with the discussion upon the guide-framing of gasholders, may prove of invaluable service to those engaged in designing these structures. Although I have a strong prepossession in favour of the employment of guide-framing, I am prepared to admit the possibility of doing without it, with some degree of economy, in structures of limited size.

I am deeply sensible that what I have laid before you may be deemed "flat, stale, and unprofitable;" but as "there is nothing new under the sun," so it is difficult to present to educated minds fresh and attractive subjects worthy of sustained thought and inquiry. It would, I assure you, have afforded me much gratification and pleasure if the leisure and means at my disposal had enabled me to produce some facts or ideas of novel interest to command your attention; but the constant demand of my ordinary duties and responsibilities has quite precluded any special effort, and I must ask you to accept my short and incomplete address with patience and resignation.

The Committee recommended, and after some discussion it was agreed, that a copy of the annual volume of Transactions of the District Gas Associations of the United Kingdom should be presented to each member, as in previous years. It may be remembered that at the last meeting a question arose as to whether this should be done on the present occasion, in view of the proposition that arrangements should be made for technical lectures to be delivered in connection with the Association at Birmingham. As, however, there is some probability of the lecture scheme not being carried out, at all events until later on this year, the proposal in regard to the presentation of the book was almost unanimously carried. Subsequently a discussion took place on the paper read by Mr. Taylor at the previous meeting, entitled "An Oft-Repeated Question: Are High Carbonizing Temperatures Convenient and Profitable?" The proceedings terminated with a vote of thanks to the President for his address; and the members and a few friends afterwards dined together.

ON THE CONSTRUCTION OF GASHOLDER TANKS.

By CHARLES HUNT, M. Inst. C.E., of Birmingham.

[A Paper read before the Association of Birmingham Students of the Institution of Civil Engineers, Wednesday, Feb. 20, 1889.]

Although the early history of the means employed for storing and delivering gas belongs to the domain of chemistry and physics rather than to that of engineering, it may be fitting, as an introduction to our subject, to remind you that the prototype of the modern gasholder is to be found in the invention of Lavoisier or Meusnier, or of both, in the latter portion of the last century. The first description of this appeared in the year 1782, and was that of a square vessel inverted in a square tank filled with water, and provided with two pipes for the inlet and outlet; the vessel or holder being suspended by a chain which passed over the curved end of a balanced lever, and was counterbalanced by ordinary weights placed in a scale. In his work entitled "*Opuscules Chimiques et Physiques*," published in 1789, Lavoisier thus refers to the apparatus: "I have given the name of gasometer to an instrument of which I am the inventor, and had made with the object of producing a continuous and uniform supply of oxygen for experiments of fusion. Since then, M. Meusnier and myself have made considerable corrections and additions to our first trials; and we have transformed it, in a manner of speaking, to be a universal instrument, which it would be difficult to dispense with whenever it may be desirable to make experiments of rigid exactitude." He then proceeds to describe the gasometer, of which here is a diagram (fig. 1); being substantially the same as that already referred to, but cylindrical instead of square in form, as proposed by him at the earlier period.*

We are told that this form for gasholders was first adopted on a working scale about the year 1815; and some indication of the state of this branch of engineering science at that time may be afforded by the fact that the larger tanks were made of wood, after the manner of brewers' vats. Indeed, it is upon record that a second-hand brewers' vat was actually used for this purpose by the Chartered Gas Company.

Passing over the various attempts that were made, by means of ingenious mechanical contrivances, to meet the growing requirements for storeage capacity, and at the same time avoid the necessity for constructing large tanks, the real interest in our subject

* This was taken from the illustration appearing in the JOURNAL, Vol. XXV., p. 283, and in "King's Treatise on Coal Gas," Vol. II., p. 42.

commences a few years later than the date already given, when brick tanks began to be constructed. As may be supposed, the first of this kind were of very small dimensions; but they rapidly assumed greater proportions. At the present day the largest tanks, made either of brick or concrete, have a depth of between 50 and 60 feet, with an extreme diameter of 250 feet; and it is evident that the limits of size have not yet been reached.

It may almost appear to be superfluous to lay stress upon the importance of knowing as much as possible of the nature of the ground in which it is intended to construct a gasholder tank; and yet many difficulties, and even disasters, have been incurred through neglect of this elementary precaution. To some of these I shall have occasion to refer. It is not, however, to be supposed that all is invariably "plain sailing," even when the greatest pains have been taken to secure accurate information as to the subsoil, either by means of trial holes when no great depth is needed, or by boring when the work is of greater magnitude. There is a touch of humour in the following reference to the subject by an American writer. He says: "A hole in the ground of large dimensions has elements of uncertainty about it that give to its excavation somewhat of the zest with which the fisherman sets out on his expedition, in happy ignorance as to whether his venture will bring him success or only the traditional luck of his tribe. If you have made a careful estimate of the cost of excavation, it is a matter of constant and vivid interest, at each step of the descent, to note how far the character of the material varies from what you had expected to find, and consequently, how great the disparity between your estimated expense and the actual cash outlay—too prone, alas! to overrun."

Of all subsoils, perhaps the best for tank construction is the London clay, because it can be worked into a basin impermeable to water. It affords a solid foundation, when undisturbed by water, for the tank walls; and, its angle of repose being very slight, the pressure it exerts upon the back of the walls is inconsiderable. This character does not, however, universally apply to the clay occurring within the London district; for in some places it has proved to be very treacherous, exhibiting a tendency to slide forward, even though the surface be formed with a considerable angle. An example of this was to be seen a few years ago in a railway cutting in the south of London, where the rails had been lifted several times by the sliding forward of the clay sides of the cutting. In contrast to the facility usually afforded by clay, may be mentioned the unsuitability of peaty soil, in which it is a matter of very great difficulty to construct a water-tight tank, or at any rate one which will remain water-tight for any length of time, unless the full depth of peat can be got out, and a solid foundation secured. Even then the yielding nature of the soil surrounding the walls is a constant source of trouble and anxiety. Sand and gravel do not present any particular difficulty, provided the site be thoroughly drained of water well below the foundations. In such a soil, however, it being of a loose nature, the trench should be well timbered; and regard must be had in designing the tank wall, to the pressure exerted against it by the backing during construction and until the tank is filled with water. Perhaps, in view of its suitability in other respects, the most troublesome ground in which to construct a tank is sandy loam, or sand and gravel interstratified with loam; the loam making it very difficult indeed to drain sufficiently to get a dry bottom for the foundations. Occasionally the engineer has to deal with chalk, or sand, or porous rock; and when that is the case his lines have fallen in pleasant places. Sometimes, also, although not often in this country, he has to form his tank out of hard rock; the cost of excavating being largely compensated by the tolerable certainty of a satisfactory issue to his labours.

It will be readily understood, even from these necessarily brief observations, that the cost of gasholder tanks must bear an intimate relation to the ground in which they are constructed, apart from any question of superior skill or economy in design; and when I tell you that the difference in cost between one tank and another of equal size may amount, and has amounted, to more than double, it may appear that the selection of a site having the most favourable subsoil is a first and foremost consideration. Unfortunately, however, from our present point of view, we have in reality very little choice in the matter. We are, in the first place, limited to the district within which the gas undertaking is carried on; and the geological features of the country present many variations. In the next place, as a rule (to which, however, there are many noteworthy exceptions), it is most suitable for general convenience, no less than for the purposes of distribution, to place the gasholders in close proximity to the manufacturing plant, the locality of which is mainly determined by the facilities afforded for the transport of materials. While, therefore, it would not be correct to say that in the selection of new ground for gas-works its suitability or otherwise for tank construction is not taken into account, it is certain that in the majority of cases the ground has had to be taken "for better, for worse," Consequently, it follows that no fair comparison can possibly be made between the cost of tanks constructed in different districts, or even in different localities of the same district, unless all the surrounding circumstances are duly considered, and balanced with the greatest care.

It may be mentioned here that, for small gasholders, where excavation is likely to prove exceptionally difficult and costly, cast or wrought iron tanks—especially the former—are frequently employed. In either case, it is usual to form the bottom with cast-iron plates having inside flanges laid upon a concrete foundation, made perfectly level by floating, or having a small space between it and the plates, to be filled in and made solid by grouting. It is, of course, essential that the concrete foundation, which need not be of any great thickness, should rest upon solid ground; otherwise the structure will most assuredly come to grief. An instance of this occurred only a few years ago. A tank and gasholder had just been completed, and water was being filled in. This operation was nearly completed, when the tank began to leak badly in several places, and had to be emptied as speedily as possible, in order to avoid a greater catastrophe. On examination, it was found that the concrete foundation had given way; the cause being discovered in the existence of traces of a former estuary of the adjoining river, long since filled up and forgotten. In the result, the entire structure had to be taken down, and was rebuilt upon a fresh site.

This incident recalls another, of a somewhat similar kind, but having a different ending, which occurred about the same time, and in the same locality. Although having no connection with tank building, the lesson it affords in dealing with foundation work may justify the present digression. The authorities of the town had erected, at very considerable expense, a new Town Hall, of which they were justly proud. Shortly after its completion, however, one side of it, facing the river, only a few yards distant, showed signs of settlement, and ominous cracks appeared. Borings were taken, and these proved the existence, to a depth of nearly 25 feet, of a very unsatisfactory subsoil, consisting mostly of a deposit of silty clay, beneath which occurred the solid sand and ballast. It is believed that this deposit indicated the site of another old estuary of the same river, and upon it rested the foundations of the building only about 4 feet below the surface. The settlements continued for two or three years, occurring mostly in the winter months, and during the period of lowest tides. This, coupled with the fact that the water beneath the building had been observed to rise and fall with the regularity of the tides, appears to have suggested as a remedy the construction of a considerable length of new quay-head with iron sheet piling, so as to cut off communication with the river. Acting, however, under the advice of their consulting engineer, the authorities commenced operations with the view of underpinning the foundations. With the intention of reaching the solid ground for this purpose, it was proposed to sink four shafts, each 6 feet wide, one at either end of the wall, and two near the centre. These being filled in with concrete, the intervening spaces were to have been dealt with in the same way, in 6 feet lengths. The plan, however, proved a failure. One shaft was carried down at considerable expense, and another partially sunk, but this could not be continued any further, owing to the silt boiling up; while the continual pumping removed soil as well as water, threatening destruction to the building. A second plan was then proposed. This was to widen out the existing foundations on either side, by means of concrete blocks set in cement, upon which were to be supported cross girders formed of 12 in. by 6 in. joist-iron, placed about 4 ft. 6 in. apart, for carrying the walls. It was intended to lift the girders to a bearing by hydraulic jacks, and then to wedge them perfectly tight. While, however, this plan was under consideration, an alternative one was proposed by a local architect and engineer; and this, after meeting with much discouraging opposition, eventually gained the approval of a majority of the Town Council. Under the new direction, cast-iron screw piles were driven down at intervals on either side of the walls, through the full depth of the uncertain subsoil, and about 3 feet into the solid ground. Upon the level heads of these piles were placed longitudinal girders (one pair on either side of the wall); and suspended from these, by means of screwed bolts, were cross girders, passing underneath the concrete foundations, and carrying the entire weight of the building. When everything was ready, the bolts were tightened up a little at a time, until the walls were lifted to about their original position. The disfigurement caused by the cracks was then removed by cutting out and re-facing; and the whole of the ironwork was covered with concrete, to preserve it from oxidation. The entire operations were carried out without any additional disturbance to the building.

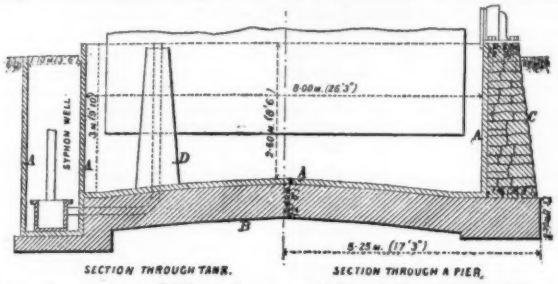
Tanks with cast-iron sides are invariably strengthened by wrought-iron bands, which have been not inaptly compared to the hoops of a cask, since they hold the structure together by sustaining the bursting pressure of the water within the tank. Their strength has therefore to be proportioned to the calculated strain upon them due to such pressure; the distance between them being gradually increased from the bottom, where the pressure against the sides of the tank is greatest, to the top, where it is least. Wrought-iron side plates, although more liable to corrosion than cast-iron ones, are frequently preferred to the latter, because there is always a certain amount of danger attending the use of bands, from the giving way of a cottar, or some other fastening. In America, tanks made of both wrought iron and steel are somewhat largely used; and it is claimed for them that they cost much less than the generality of excavated tanks. When travelling in Belgium a few years ago, I came across a large tank formed of channel iron rolled to a very wide section. The lengths were bent to the required circle, placed one on top of another, and their flanges riveted together. This plan affords great strength and stiffness, and appears specially suitable for tanks of large diameter.

(To be continued.)

At the recent election of School Board candidates at Ryde (I.W.), Mr. George Garnett, the Engineer and Secretary of the Ryde Gas Company, was returned at the top of the poll.

AN IRON AND CEMENT GASHOLDER TANK.

The accompanying illustration (for which, with the following particulars, we are indebted to the *Journal des Usines à Gaz*) shows two sections of a gasholder tank of iron and cement, on M. Monnier's principle,* constructed at the Plombières Gas-Works by M. Bouron, the Engineer. The town is one of the well-known watering-places of France; and consequently when the place was full of visitors, the storeage room at the gas-works was taxed to the utmost. Before the work about to be described was undertaken, there was only one gasholder of 9000 cubic feet capacity—well made, but working in a tank which had been filled with water before the cement had had time to set. The result, of course, was a very considerable leakage through fissures in the wall; and when the daily output of gas was about 12,000 cubic feet, it was scarcely possible to store 7000 feet. In the event of any accidental interruption of the manufacture, there would



SECTION THROUGH TANK. SECTION THROUGH A PIER.

have been a possibility of a cessation of the supply of gas. In these circumstances, the construction of a small auxiliary holder, to contain 4400 cubic feet of gas, was determined upon. But there were several difficulties in the way. Not only was there very little room on the works (the available space at the disposal of the Engineer being something like 110¼ square metres, or about 132 square yards), but the ground on which they stood was all made, and was not equal to sustaining a weight of more than 3000 to 4000 kilos. per square metre—say, roughly, 3 or 4 tons per square yard. The problem to be solved was therefore rather complicated. It was necessary to arrive at a total weight per square metre which would be below 4000 kilos., without exceeding a total diameter of 10·50 metres (34 ft. 6 in.) for the concrete foundation. The maximum superficial area over which the total weight had to be distributed was therefore 86·58 square meters; and the weight was not to exceed 346,000 kilos.

The diameter of the bell was fixed at 7·30 metres, and its height at 3 metres; the weight of iron being 5641 kilos. The diameter of the tank was settled at 8 metres, and its height at 3 metres; the weight of water to be contained therein being reckoned at 150,792 kilos. Enclosed as it was by the coal-store, the tar-well, and the river, the tank could not have a diameter of more than 8 metres; and calculating the total weight of material that would be necessary in an ordinary masonry tank, the Engineer found that it worked out to 5250 kilos. per square metre of surface, or considerably more than the ground was capable of supporting. In face of this difficulty, it occurred to him to employ M. Monnier's system of construction, and build the tank of iron trellis-work and cement—a plan which has frequently been adopted for small water-works reservoirs. He made the average thickness of the tank wall 3½ inches—4 inches at the bottom, decreasing to 3¼ inches at the top. The total weight of the tank and its four supporting piers was 19,230 kilos.; to which there was added the weight of the ironwork employed for the holder, the water in the tank, and the concrete foundation—making a total of 305,538 kilos., or 3530 kilos. per square metre. This was a difference of 1720 kilos. per unit of surface. The holder was completed, and has been in operation nearly a year, working very satisfactorily.

It will be interesting, in connection with the foregoing particulars, to give some figures as to the cost of the tank, as compared with one constructed in the ordinary way:—

Monnier System.

	Francs.		Sterling.
Ironwork	2933	..	£117
Tank wall and floor (contract)	4000	..	160
Excavation work, sump holes, repairs, and miscellaneous expenses	878	..	35
Total	7811	..	£312
	Or 62 frs. 50 c. per cub. met.		Or £70 7s. 6d. per 1000 c. ft.

Ordinary System.

	Francs.		Sterling.
Ironwork	2933	..	£117
Excavations	948	..	38
Masonry	2611	..	104
Cost of sump holes	942	..	38
Total	7434	..	£297
	Or 59 frs. 48 c. per cub. met.		Or £67 10s. per 1000 c. ft.

The cost of the entire work was therefore greater by 377 frs. than it would have been if the ordinary system had been followed. There were, however, as already stated, special reasons for adopting a different plan of construction; and the Engineer has had every reason to be satisfied with his decision. The tank was a perfectly sound piece of work. After its completion, it was allowed to stand for three weeks before it was filled with water; and when this had been done, the level was tested after a lapse of eight days, and found to be practically unchanged. The bell of the holder was blown up with air, and remained perfectly stationary for three days. The construction of the tank occupied 24 days, and the erection of the holder about 12 days.

* This was explained at great length in a series of articles in Vol. XXXVII. of the JOURNAL.—ED. J. G. L.

MANUFACTURE OF PARAFFIN OIL IN SCOTLAND.

At the Meeting of the Scottish Section of the Society of Chemical Industry, held in Edinburgh on the 5th inst.—Mr. G. T. Beilby in the chair—Mr. D. R. Steuart, F.I.C., F.C.S., of the Broxburn Oil-Works, read a paper on "The Manufacture of Paraffin Oil," illustrated by samples of finished and intermediate products, and by drawings of the distillation plant. The author first indicated the chemical composition of the shale which is the great basis of the industry; passing on to the yield of crude oil (30 gallons per ton), water gas (2000 cubic feet), and ammonia (18 lbs. of sulphate) resulting from its distillation. The Broxburn retort is Henderson's patent, fired by gas and spent shale alone; and, in consequence of maintaining temperatures the most favourable for distillation, it furnishes crude oil both generous in quantity and excellent in quality. The Broxburn works employ 784 of these retorts, ranged in 16 benches, and equal to the manipulation of 1000 tons of shale per day. With the crude oil ammoniacal liquor is obtained, separating readily by reason of its greater specific gravity, and afterwards passing through a column still, there to give off the ammonia from which the sulphate is made. The daily quantity of liquor treated is 35,000 gallons. Crude oil refining comes under three heads: (1) Distillation; (2) treatment with sulphuric acid and caustic soda; (3) extraction of scale by cooling and pressing. The distillation is chiefly Henderson's connected still system, for which is claimed great economy in fuel, plant, and labour; also a high class of distillates as the final result. Thereby the oil is freed from a portion of its impurity, and separated into the various products—naphtha, burning oil, and lubricating oil; these differing from each other in boiling point and specific gravity. Between the various distillations necessary before the finished result can be attained, the oil is treated with strong sulphuric acid (oil of vitriol) and caustic soda, which precipitate impurities in the form of black tars. The vitriol tar is washed with water to extract the sulphuric acid, used in making sulphate of ammonia, while the freed tar, applied in the form of spray, goes to the firing of the stills. To extract paraffin scale, the heavy oil which contains it is reduced to a low temperature by freezing-machines, and then pumped through filter-presses; these arresting the scale while giving passage to the oil. Henderson's patent cooler is now used; its comparative slowness permitting the formation of larger crystals than formerly, and resulting in a greater quantity of scale and a finer quality of oil. This scale, refined into wax, is used for numerous purposes, but chiefly for candle making. Mr. Steuart closed his interesting paper by giving some statistics of the shale oil industry of Scotland. He put the invested capital at £2,000,000; the number of workpeople at 10,000; the shale annually distilled at 2,000,000 tons, with a yield of 60,000,000 gallons of crude oil; the value of a year's output, taking in all the products, at about £1,500,000.

OIL-WELLS IN CENTRAL ASIA.—Mr. Ouspensky, a Russian engineer who was sent to Central Asia on a special scientific mission, reports that the oil-wells at Penjakend, near Samarcand, in the Zerafshan Valley, contain at least 9,000,000,000 lbs. of perfectly pure oil.

A TEXT-BOOK FOR PLUMBERS.—As intimated in the JOURNAL last week, we have received from Messrs. Crosby Lockwood and Son a copy of Mr. W. P. Buchan's comprehensive text-book on "Plumbing," which has now reached its fifth edition. It is a characteristic of all the text-books issued by the above-named firm that they are eminently practical; and therefore it is only what one would expect to find that the work now under notice is from the pen of a handicraftsman who not only thoroughly understands his subject, but knows how to explain its mysteries so as to make his writing useful to the tyro at the business. The author himself confesses to having felt the need of such a book as this in his apprentice days; and the present production is the outcome of his industry in making notes and collecting facts and useful data. That the book should have reached a fifth edition is sufficient proof that its contents have been appreciated in the past; and that they will be still more valued in the future, in view of the institution of special technical classes for plumbers throughout the kingdom as the result of the "registration" movement, goes without saying. To attempt to describe the contents in the space at our disposal would be ridiculous. Suffice it to say that they comprise not only all that is necessary in the practice of the plumber's craft but supplementary chapters on house drainage and ventilation. The text is fully illustrated. As a Glasgow man, it is only natural that the author, in his chapter on "Water-Regulators and Gas-Stoves," should give prominence to the water-regulator and gas-stoves which have been designed by Mr. W. Foulis, the General Manager of the Gas Department of the Corporation of that city; and that, in his preface, allusion should be made to the loss sustained by the city in the death of their Analyst, Dr. W. Wallace, F.R.S.E., which took place while the last sheets of the book were passing through the press.

Register of Patents.

WATER-HEATING APPARATUS.—Verity, B., of Maida Vale, W. No. 817; Jan. 18, 1888. [8d.]

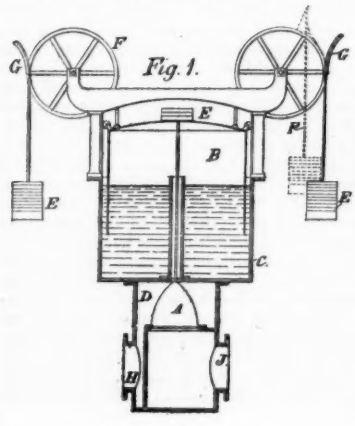
This invention relates to an improved construction of water-heater for baths and other domestic purposes; and it has for its object to heat the water quickly and out of contact with the gaseous products of combustion, so that it may be used for potable purposes. The casing of the heater is constructed with double walls of cylindrical or other shape, enclosing between them an annular water space. The space within the inner cylinder is traversed by water-heating tubes of very flattened cross section, set at a slight inclination, and placed side by side in tiers above one another; those of one tier being opposite the spaces between the tubes of the tier above and below. These tubes communicate at their opposite ends with the annular water space; and are directly exposed to the heat from a gas-burner at the lower part of the apparatus. The annular water chamber is supplied with water from a tray at the top of the apparatus, through tubes of very small diameter, leading from the underside of the tray down within the heating chamber to the bottom of the annular water chamber. These small tubes pass between the transverse water-heating tubes; being for this purpose of zig-zag form. They divide up the water, and deliver it uniformly round the circumference of the water chamber. The water is supplied to the tray, flows through the descending-pipes to the lower part of the annular chamber, and is heated in its descent. It then ascends the annular chamber, and traverses the tubes, becoming still further heated, and is drawn off from the upper part of the annular water-casing. The lower part of the stove at which the gas-burner is situated is open, and fitted with a reflector beneath the level of the burner; so that, whilst the latter is concealed from direct view, light and heat therefrom will be reflected into the apartment. The heated products from the burner strike against the transverse flat tubes, and are by them deflected against the sides of the water chamber, and also against the descending tubes; and after traversing between the whole series of cross tubes, strike against the concave bottom of the water-tray.

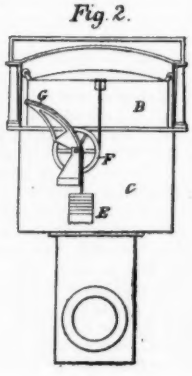
WASTE-WATER METER.—Ginman, N. J., of Halifax. No. 2945; Feb. 28, 1888. [1s. 1d.]

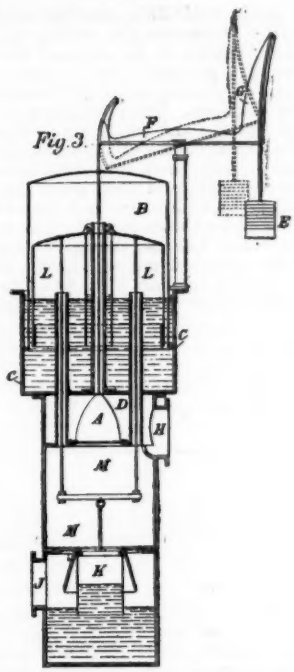
In this waste-water meter, the patentee uses the principle of the ordinary reflux valve, back-pressure valve, or check-valve as an apparatus for measuring the flow of water in pipes, to which is connected a recording apparatus consisting of a cylinder or drum revolving by means of a clock. To this is attached a paper diagram of the kind used on many of the well-known means for taking diagrams—such as from gas-governors, pressure-recorders, &c. The valve-door of the apparatus is fixed in such a position that, when the flow of water is at rest, the weight of the valve-door in all cases will be lying on the seating of the orifice through the meter, thereby closing the water-way between the inlet and outlet of the meter; and, by so doing, will show on the diagram that no water is passing at this particular time. By these means, says the patentee, it will be seen that water can pass only by pushing open the door of the valves, which must be lifted off their seats before any water can pass through the meter to the outlet side. From the valve-door is arranged an horizontal shaft, working through a stuffing-box on the side or top of the reflux or back-pressure valve; and from the end of the shaft is carried a long link, in which works a roller connected to a forked connecting-rod carried in a vertical form of motion through a slide forming a guide for the rod to work in against the revolving cylinder, provided with an adjustable pencil for marking on the diagram attached to the cylinder, and by so doing will show the areas when the valve-door is open, or the space for the water to pass through the meter.

REGULATING THE PRESSURE OF GAS IN PIPES OR MAINS.—Leather, J. P., of Burnley. No. 3275; March 3, 1888. [8d.]

Gas regulators or governors, says the patentee, have hitherto generally been constructed to maintain a constant pressure at the main outlet independently of the amount of gas consumed. It has, therefore, been customary to employ men to increase and decrease the pressure at various times; but even then the regulation of the supply is more or less a matter of guess-work, and is left to their own judgment or that of the manager. In some cases pressure-changers have been employed, worked by clockwork; but "they are unsatisfactory in that they do not provide for the increased consumption of gas during cloudy or foggy weather, nor do they adjust themselves automatically to suit the length of the days." The object of the present invention therefore is to provide a governor which adjusts the pressure of the gas at the outlet automatically;







so that with increased consumption, the pressure increases, and with decreased consumption, it is decreased.

Figs. 1 and 2 are a vertical central section and an elevation of an ordinary type of governor with part of the present invention applied to it. Fig. 3 is a vertical central section of an improved governor constructed wholly in accordance with the invention.

In carrying out the invention, the ordinary type of governor may be employed, consisting of a valve A (figs. 1 and 3), provided with a seat, and suspended from an open-bottomed holder or bell B, working in a tank C, containing water; the interior of the holder being connected with the gas at the outlet D of the valve. The force tending to cause the holder to descend and the valve to open, is regulated by weights E (on the holder or on a chain), which act on the holder through the intervention of pulleys or levers F. These levers may be so placed and arranged that, as the holder ascends, the weights descend (as in figs. 1 and 3), and *vice versâ*—the weights being hung in this instance on the further side of the axle to that on which the chain attached to the holder works; or they may be arranged as in fig. 2, so that the weights ascend as the holder ascends, and descend as the holder descends—the weights being in this case hung on the same side of the axle as the chain attached to the holder.

In the improved governor, the chains supporting the weights do not hang from the periphery of the pulleys, or from the levers in the usual manner, but from arms or projections G attached to the pulleys or levers or to their axles, and preferably curved as shown. The arms are attached to the pulleys or levers or their axles in such a manner that as the holder ascends, due to increased pressure at the valve-outlet, the weights hang further from or nearer to the axis of the pulley or lever, so that greater force is applied for raising the holder, or less force for pulling down the holder, according to which of the two arrangements is adopted. On the other hand, as the holder descends, owing to diminished pressure or increased consumption of gas, the reverse action takes place; the holder pressing downwards with increased force. The curve of the arms is preferably designed on the assumption that the additional outlet pressure required to meet the increased consumption is proportional to the square of the rate of consumption. The weights on the holder and on the arms are adjusted so as to give the desired minimum pressure when the holder is raised. The maximum pressure is increased or diminished by increasing or diminishing the weights on the chains—at the same time making a corresponding alteration in the weight on the holder, if necessary, so as not to affect the minimum pressure.

The mode of action is as follows:—When the pressure of the gas at the outlet H of the governor diminishes, owing to increased demand for gas, the holder B (which is upheld by this pressure) descends and opens the valve A. This permits an increased flow of gas; and owing to the peculiar arrangement of the weights and arms already described, the holder presses downwards with greater force the farther it descends, and therefore it does not come into equilibrium again until the pressure in the delivery main has increased beyond its former amount. When the consumption of gas decreases and causes momentary increase in the pressure in the main, the action is, of course, reversed, and the pressure is diminished.

This arrangement of weights and arms may be successfully applied to existing governors where the pressure at the inlet J of the governor is practically constant; as in the case of works with one single-lift holder, or in the case where the gas is first passed through an ordinary governor adjusted to give a constant pressure at least equal to the maximum pressure required at the outlet H. In the latter case, one governor might be employed to give a constant inlet pressure to a series of governors supplying different mains, and each provided with this arrangement of weights and arms. When, however, the inlet pressure of gas is variable, the governor is provided with two valves—viz., a first or inlet valve K communicating with a second or outlet valve A (see fig. 3). The first is preferably an equilibrium valve. It may consist of a cylinder open at top and bottom, suspended with its lower edge in water, so that the pressure of the gas upon it tends neither to open nor

close it. Two open-bottomed holders L B are also provided, preferably cup or bell shaped, and inverted in the usual way in a tank or tanks C containing water. One of the holders L works inside the other (which is the ordinary holder B above referred to), and is attached to and controls the first or inlet valve K by means of rods, which work in pipes attached to the casing; the ends of the pipes being above the surface of the water in the tank C, so as to communicate the pressure of the gas from the outlet M of the first valve K (which is also the inlet of the second valve A) to the interior of the holder L. The exterior of this holder, which is also the interior of the second or outer holder B, is connected in a similar manner, to the outlet D of the second valve A and to the main outlet H. The pipe for this purpose passes through a central passage in the inner holder L. This holder is supported by floats if necessary; and it is so adjusted as to be in equilibrium when the pressure in its interior exceeds that on its exterior by a definite and convenient amount. As a consequence of this arrangement, the first valve K maintains a pressure at the inlet M of the second valve A greater by a constant amount than that at the main outlet H. The interior of the second holder B communicates with the outlet D of the second valve A, which valve is attached to, and controlled by the holder as already described. The second valve A may be of the ordinary conical type; the section of the cone being preferably a parabola. As the difference between the pressures at the two sides of this valve is constant, the amount of gas passed through the valve is constant for any given position of the valve. Hence the position of the valve or its holder may be taken as an index of the rate of consumption. The second or outer holder B (provided, as aforesaid, with the arrangement of arms and weights already described) produces the desired effect of increased pressure for increased consumption and decreased pressure for decreased consumption. The inner holder L and first valve K neutralize the effect of variable inlet pressure, and make the position of the second or outer holder dependent only on the rate of consumption, in the manner already described. The first holder L may be guided by rollers or their equivalent rolling on the surface of the pipes supplying gas to the holders, or on the shell of the outer holder, or on guides fixed to the casing or framing. The other holder is guided similarly.

The arrangements above described may, however, be modified to a certain extent without departing from the nature of the invention. For example, the following arrangement might (says the inventor) be employed:—The first or equilibrium valve is made to open upward, and work in a cylinder having triangular slots with their points downward; so that as the valve rises, these slots are uncovered and allow gas to pass. This valve is connected with, and controlled by, a holder situated below it, and having the same area in plan as the valve; so that the inlet pressure acts equally and in contrary directions on the valve and its holder. The interior of the holder communicates with the outlet D of the second valve A, or with the exit H to the main; while the top of the valve is acted on by the pressure at its own outlet, which is the inlet to the second valve A. The holder and valve are upheld against the excess of downward pressure on the valve by a float, and maintain a constant difference of pressure between the inlet and outlet of the second valve A. It will be seen, however, that in this modification the external and internal pressures on the subsidiary holder are reversed, as compared with the arrangement shown in fig. 3. The second valve and holder may be exactly similar to that before described; but, if desired, it may be smaller, and may also be upheld by a float. It can be guided at the top by a bar working between two grooved pulleys or rollers; and this bar may be graduated to show the extent of opening of the valve.

WATER-METERS.—Johnson, J. Y., communicated from La Société Fritz Perret et Cie., of La Chaux de Fonds, Switzerland. No. 3609; March 8, 1888. [8d.]

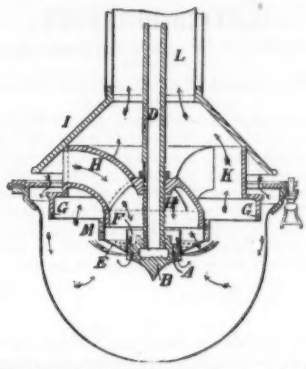
This invention relates to meters for measuring water by the action of pistons, which are caused to reciprocate in cylinders by the pressure of the liquid to be measured; the motion of the pistons being caused to operate any suitable mechanism for registering or recording the quantity of water passed through the meter.

The two double-acting pistons are employed working in cylinders, to which the water is admitted at opposite ends alternately. The admission of water to the cylinders is controlled by valves so arranged that the valve controlling the supply to one cylinder is operated by the piston working in the other cylinder; and *vice versâ*. With this object, the piston in each cylinder is connected to the valve of the other cylinder by a rod so arranged that the piston does not begin to move the valve until it has made about three-quarters of its stroke. A convenient method of arranging the meter, say the patentees, is to place the two cylinders on opposite sides of a valve-box, with their axes in the same line, or preferably with their axes not truly in the same line, but slightly displaced laterally. In this way the piston-rod from one cylinder is enabled to act directly on the slide-valve of the other, when the two valves are arranged side by side in a valve-box between the opposite ends of the two cylinders. It results from this construction that the pistons move alternately and separately, except at the time required for closing and opening the passages for the liquid. In other words, neither of the pistons commences to move until the other has accomplished three-quarters of its stroke. Moreover, the pressure of the water is maintained on one of the pistons even after it has ceased to move and during three-quarters of the stroke of the other piston—*i.e.*, until the latter has closed the distribution orifice by the aid of the corresponding slide-valve.

It is claimed that this action is of much importance, as it ensures great regularity in the working of the meter, and an absolutely accurate indication of the volume of the liquid passed through it.

REGENERATIVE GAS-LAMP.—Justice, P. M.; communicated from E. Stein, of Philadelphia, U.S.A. No. 4195; March 19, 1888. [8d.]

In this lamp the burner proper A is made of metal or steatite; the bottom being formed into a downwardly extending projection B, the exterior surface of which may be described as a cone with an inwardly curved surface between the apex and base, which has a tendency to divide, deflect, and equalize the flow of air upon the gas-jets. The burner is provided with a chamber, the upper part of which is threaded to fit a corresponding thread upon the lower extremity of the gas-pipe. A series of holes are pierced in the burner, arranged in a horizontal plane



radially about this chamber in such a manner as to form independent conduits from the chamber to the exterior periphery of the burner; and through these the gas issues in a horizontal direction beneath the perforated metal plate E. Between these holes are formed a series of radial slits which constitute the air ducts or conduits from the central downward air passage to the underside of the burner. The chamber F is formed of a loose metal ring adapted to slip down the burner nearly to the gas conduits, thus closing the upper part of the outer faces of the radial slits and virtually turning them into tubes. These air conduits not only supply air at the sides and beneath the jets of flame at the point of combustion, but also serve to cool those parts of the burner which are almost directly in contact with the flame. The deflector plate G is so arranged that an annular passage is formed on its exterior, through which the air passes from the outer atmosphere, downward into the globe, as indicated by arrows. The regenerator is formed of three passages H, surmounted by a cone top I, the lower portion of which does not quite touch the top plate. The outer walls of the passages form ducts K through which the escaping products of combustion flow to the chimney L. The cone top I rests upon the circular rim of the regenerator, so as to separate the currents of inflowing air by the passages H from the products of combustion which are deflected by the conical surface I against the gas-pipe D to the chimney L. The perforated air equalizing and distributing plate E (at the lower end of the sheet metal cylinder M) is surrounded by a ring of asbestos or other suitable heat-resisting material.

WATER-HEATERS.—Winterflood, J., of Euston Road, N.W. No. 17,455; Nov. 30, 1888. [6d.]

This invention relates to the construction of water-heating apparatus; wherein the water is heated in passing through the products of combustion. Shortly, the apparatus consists of a cylindrical metal body, about 12 inches diameter and 24 inches high, to form the outside case. There is an inner cylinder about 8 inches diameter and 24 inches high; the bottom end being coned out to the size of the outer cylinder, and then connected thereto with a water-tight joint. An intermediate double cylinder is constructed about 10½ inches diameter and 24 inches high (the inner cylinder being 1 inch shorter than the outer cylinder, and covered with an hollowed plate); and about 6 inches from the top, a row of fine holes is pierced to form a spray inside and outside the double cylinder. This spray, playing on the inner and outer cylinders, prevents them from getting burnt. Below the whole of this arrangement, a reservoir is placed, with a number of ordinary burners inserted to form the heating power.

APPLICATIONS FOR LETTERS PATENT.

2367.—WASER, J. J., "Improvements in, or additions to burners for oil and gas lamps and stoves." Feb. 11.

2508.—MAXIM, H. S., "Improvements in and relating to apparatus for carburetting gas." Feb. 12.

2572.—KENT, W. G., "Improvements in apparatus suitable for use as a water-meter." Feb. 13.

2578.—GREEN, T. A., and WALKER, C. M., "Improvements in governors for regulating the supply of illuminating gas and other gaseous fluids." Feb. 13.

2599.—FLETCHER, W. F., "Improvements in gas-pressure regulators." Feb. 14.

2638.—STEWARD, J. H., and FLEMING, J. A., "Gas testing apparatus." Feb. 14.

2649.—GARDIE, C. F. L., "An improved gas-engine and gas-generator therefor." Feb. 14.

2650.—CHANDLER, J. C., "Improvements in apparatus for washing and scrubbing gas." Feb. 14.

2664.—SPONG, J. O., "Novel means and apparatus to facilitate the enrichment and purity of flame of coal-gas." Feb. 14.

FATAL ACCIDENT AT THE SWANSEA GAS-WORKS.—Last Friday two workmen, while engaged in repairing a purifier-valve at the Swansea Gas-Works, became overpowered by inhaling the gas; and unfortunately one died almost immediately from the effects.

ROCKHAMPTON (QUEENSLAND) GAS COMPANY.—The report of the Directors of this Company which was presented to the shareholders at their 32nd half-yearly meeting on the 28th of December last stated that the net profit for the six months ending Nov. 30 last was £1942, from which the Directors recommended the payment of a dividend of 10 per cent. per annum; writing off £200 for deterioration and depreciation of plant, and carrying forward the balance (£273). As the Directors expected, the demand for gas is greatly on the increase. The recent building improvements in the town have had a good effect on the Company's business, and the number of new consumers upon the present line of mains is steadily increasing. The sale of gas during the half year covered by the report was greater than at any period of the Company's existence, and the Directors expressed the opinion that the consumption during the current six months will be equally satisfactory. The question of additional storeage at the works (which are under the supervision of Mr. W. T. Nye, the Company's Engineer), is engaging the Directors' attention.

Correspondence.

[*We are not responsible for the opinions expressed by Correspondents.*]

THE SO-CALLED "METHVEN" PROCESS OF PURIFICATION.—A DISCLAIMER.

SIR,—Mr. Leicester Greville, in his article on "Recent Progress in the Purification of Coal Gas from Sulphur Compounds," appearing in the current issue of the JOURNAL, has associated my name with his third process. As I am anxious to prevent any further misapprehension on this subject, please afford me the opportunity of disclaiming any connection with the introduction or invention of the process. It is generally known that it was used by several Metropolitan Gas Engineers long before I had compulsorily to deal with the removal of "sulphur in other forms;" and therefore I am only an addition to the number who had before adopted the system.

JOHN METHVEN.

Nine Elms, S.W., Feb. 20, 1889.

MR. SOMERVILLE'S PRESIDENTIAL ADDRESS.

SIR,—Mr. Somerville will, I know, pardon me for drawing attention to a paragraph in his excellent address, in which he did me the honour to refer to my articles on "The Guide-Framing of Gasholders."

The following is the passage he refers to, and which he states "does not accord with his practice:"—

"Iron shortens or lengthens about $\frac{1}{11000}$ part of its length, for every ton per square inch strain upon it. This property of the elasticity of iron is very apparent in a large gasho'der. For example, we will take the shortening of the top curb of a gasholder 200 feet diameter. The circumference in inches would be 7540, one-twelve-thousandth of which is 0·628 of an inch. Therefore the curb would shorten 0·628 of an inch for every ton strain; and as top curbs are frequently strained up to 4 tons per square inch (sometimes a very great deal more), the total shortening would be at least 2½ inches, which means a reduction in the diameter of more than ¾ inch. It follows, therefore, that *the top rollers are off the guide face by ¾ inch all round*, when the holder is right up, and the curb is fully strained. The strain on the top curb is, of course, due to the pull of the top sheets; and this varies according to the pressure of gas within. When the holder is "down," there is practically no strain on the curb; and it is therefore at its full diameter. The roller carriages may be adjusted so that the rollers are absolutely tight against the guides when in this position; but immediately the holder rises, the pull of the sheeting compresses the ring, and so draws off the top rollers—making "play"—and each time the holder picks up weight (that is, cups), the curb shortens and the rollers 'eave the guides still more. This cannot be allowed for by adjusting the rollers when the holder is at its full height, because when the holder descends and the curb swells in diameter, the strains on the rollers would be enormous, besides over-straining the framing. Of course, this property of shortening under compression and lengthening under tension is applicable to the whole structure; the above has been chosen merely as an illustration. Therefore we see at once that there is no such thing as absolute and perfect fit in a huge structure like a gasholder; and, consequently, it would be very unwise to construct holders with only a few feet of guide-framing, as they depend upon perfect fit and absolute rigidity in all their parts."

As regards the shortening of iron under compression, and lengthening under tensile strain, it is not a matter which requires proof on my part. It is so well known by all engineers as an established fact, that I will not burden you with any proofs. Even a gasholder (which it has become the custom to use as a lever for upsetting all the known laws of mechanics) must bow to this principle. As to the application of the principle to the top curb, I can only say that my "practice" does not accord with Mr. Somerville's; and, strange to say, that, instead of having formulated a "theory," and then tried to adapt the gasholder to the "theory," it was just the reverse—viz., that, in consequence of gasholder top-rollers (not "grip rollers") leaving the guides when the holder cups, I looked about for the cause. I noticed the effect; but at first did not realize the cause. The "theory" I mentioned is undoubtedly the true explanation of it.

I may add, that this does not rest on my authority alone; but on the experience of one of the best gasholder erectors of the day, who states that he has noticed this effect (of the top rollers leaving the guides on cupping) times out of number.

As regards the behaviour of the East Greenwich gasholder, if it be as Mr. Somerville states, I have no doubt it is capable of being explained, without denying established principles in practical mechanics.

Mr. Somerville concludes his remarks on this question with "Let us be thankful that sometimes ordinary theory and practice will not always agree." If he will substitute the word "practice" for "theory," he will be still nearer the truth.

THEORY AND PRACTICE.

Feb. 22, 1889.

P.S.—Mr. Somerville speaks of the "grip rollers" on the East Greenwich holder leaving the guides when uncupping, and returning to the guides when cupping. This is probably due to the spring of the Piggott "dips" throwing the carriage forward, because the cup is lifting on the *inside* edge of the dip, and the weight is hanging on the *outer* edge. Or it may be due to the way in which the gasholder settles itself, and takes its bearing in the tank. Whatever it may be, it is only an additional proof of what I argue in the note Mr. Somerville has criticized—viz., "That gasholders are *not* such unyielding, rigid fits as some theorists have assumed them to be.

A NEW STOREAGE RESERVOIR AT THE DEVONPORT DOCKYARD.—A reservoir has lately been constructed at the Devonport Dockyard, in order to ensure a good supply of water in the event of an invasion, or the outbreak of fire; so that it will, for a time at least, be practically independent of the main source of supply—the cut of the Devonport Water Company. The reservoir is capable of storing above 5 million gallons of water. It is 456 feet long, 275 feet wide at the western end, and about 325 feet at the eastern end. It has an average depth of 15 feet; the extreme depth at the western end being 20 ft. 6 in. A retaining wall 14 feet thick has been built at the western end, and a wall 6 feet thick at the eastern end. In addition to the facing walls of the trench and ramparts, a lining-wall 18 inches thick, with a cavity of 12 inches for clay puddle, has been built on the north, south, and east sides. The bottom of the reservoir is covered with a 12-inch layer of clay, and a coating of Portland cement concrete 6 inches thick. The reservoir is supplied by the Company from a 12-inch main.

Parliamentary Intelligence.

HOUSE OF COMMONS,

FRIDAY, FEB. 22.

The Chairman of Ways and Means (Mr. Courtney) reported that, having conferred with the Chairman of Committees of the House of Lords (the Duke of Buckingham and Chandos) on the subject, it had been determined by them that the following Bills, in which our readers are interested, should originate in the Upper House:—Barry and Cadoxton Gas and Water Bill, Belfast Water Bill, Bristol Water Bill, Burnley Corporation Bill, Bury Corporation Bill, Cleveland Water Bill, Coventry Corporation Water Bill, Deanhead Commissioners Bill, Eastbourne Water Bill, Hythe Corporation Bill, Manchester Corporation Bill, Newcastle and Gateshead Water Bill, Newry Improvement Bill, Padiham and Hapton Local Board Bill, Plymouth Dock (Devonport) Water Bill, Rastrick Water Bill, Tuscan Gas Bill, Wakefield Corporation Bill, Windermere District Gas and Water Bill, Yeadon Water Bill.

LONDON COAL DUES.

A Bill to abolish any duties on coals leviable by the Corporation of London was brought in by Sir Joseph Pease, Lord Randolph Churchill, Sir Charles Palmer, Sir Henry Havelock-Allan, Mr. W. Crawford, Mr. Wood, and Mr. Burt, read the first time, and ordered for second reading on Wednesday, May 22.

A Bill to continue and appropriate the London Coal and Wine Duties was brought in by Mr. Baring and Sir R. Fowler, read the first time, and ordered for second reading on Wednesday, May 1.

METROPOLIS WATER ACTS.

A Bill to amend the Metropolitan Water Supply Companies' Acts was brought in by Mr. Penton, Mr. Lawson, Sir A. Rollit, Mr. R. Chamberlain, Mr. Bigwood, and Mr. Lambert, read the first time, and ordered for second reading on Wednesday, May 22.

BOROUGH FUNDS.

A Bill to amend the Municipal Corporations (Borough Funds) Bill was brought in by Mr. Woodall, Mr. Kenrick, and Sir A. Rollit, read the first time, and ordered for second reading on Wednesday, April 17.

NEWPORT (MON.) GAS-WORKS BENEFIT SOCIETY.—The annual dinner of this Society took place yesterday week. Mr. T. Canning, Assoc. M. Inst. C.E., the Engineer of the Company, presided; and there were present the Mayor (Mr. H. Faulkner), and a number of local influential gentlemen. In the course of the after proceedings, it was stated that fourteen years had elapsed since the formation of the Society; and no less than £500 had been paid away as dividends. For the year ending June 30 last, the entire receipts were £152 13s. 9d. A sum of £60 4s. 10d. had been expended in sick and funeral benefits; and £5 17s. 11d. paid to members who had left the works. Medical fees absorbed £11 13s.; and sundries £7 15s. 7d. This enabled £43 12s. 5d. to be divided among the members, and 10s. to be added to the reserve fund, which now amounts to £23 10s. For the half year ending Dec. 31, the receipts, including the balance in hand, had been £93 8s. 5d.; and the expenditure £38 4s. 7d. A number of toasts were proposed, which were all heartily pledged; and songs were contributed, which greatly enhanced the enjoyment of the proceedings.

THE UTILIZATION OF COKE BREEZE.—A Sub-Committee of the Oldham Gas Committee, which recently visited the Gaythorne Gas-Works of the Manchester Corporation, presented a report last Wednesday week on the result of their inspection. After examining a machine for the carriage of coal to the charging apparatus, the Sub-Committee were shown Perret's patent furnaces, by means of which steam is raised by using coke breeze only. The steam pressure in the boilers was about 60 lbs. per square inch; and Alderman Asquith, a member of the Manchester Gas Committee, stated that a great saving had been effected by using these furnaces. In answer to a question, Mr. Chadwick (the Manager of the gas-works), said that the quantity of coke breeze produced yearly at the Oldham works was 4000 tons. They sold it when there was a demand for it, which was not often; and the price they obtained was 1d. per cwt. For some time they had not sold any; and it was practically useless. Alderman Hall said they had two boilers at each of the Oldham works; and by utilizing the coke breeze, they would be able to keep the fires up, and yet have some to spare. He asked what was the cost of Perret's furnaces. Mr. Andrew (the Gas and Water Superintendent) said he was informed that the cost was £70 per boiler. The Mayor (Alderman Platt) said that was a large amount, as the apparatus was very simple. The Town Clerk remarked that if they utilized 4000 tons of material every year, which would otherwise be worthless, there would be a considerable saving. On the suggestion of the Mayor, it was decided that Mr. Andrew should get all necessary information about the furnaces, with a view to making a trial at the works.

THE CAPITAL OF THE HEYWOOD CORPORATION GAS-WORKS AND THE PRICE OF GAS.—In the course of a statement as to the financial position of the borough, Alderman Hodkinson informed the Heywood Town Council, at their meeting last Thursday week, that in 1882 the loans on gas account amounted to £30,036, and the interest was £1233, or about 4 per cent. The amount now owing was £38,545; and the interest was £1419. Most of the increased expenditure was in the new premises. He hoped that towards the current year's expenditure, the Gas Committee would be able to contribute £500 from profits. Mr. Lawson asked whether it would be sound business to pay money out of a concern that had a loan account so much more now than in 1882. Would it not be better to reduce the amount and the interest accruing upon it? He would not like it to go forth that the Gas Committee could pay anything towards the reduction of the rates. The profits from the gas should go to the reduction of the price of gas and of the capital account, and not the reduction of the rates. Mr. Buckley said it was almost a scandal to them that the price of gas was so high. They were told it was in consequence of the large capital account. There was something yet that wanted looking into, not merely to keep the price of gas at its present figure, but as to how to produce gas cheaper. One of the minutes referred to the sulphate plant. Some few years ago they spent a large sum on a plant of that description which was now entirely obsolete. Mr. M'Farlane said that only a small amount was spent on the sulphate plant—about £200. Mr. Lawton remarked that £408 10s. was spent on a sulphate plant that had been in use two-and-a-half years. The depreciation allowed on that plant during the time it was in use was £68. The plant stood in their books at £350; and he might say that almost the whole of it was absolutely useless. He thought they were making gas as cheaply at Heywood as at any gas-works in the kingdom, considering what they paid for coal, cannel, carting, &c. Then the large capital account had a great deal to do with the price of gas in the town; the interest on capital alone amounting to about 1s. 5d. per 1000 cubic feet of gas made. The report for the past nine months was more favourable than formerly; there was an increase of £219 in the income, notwithstanding a decrease of 2d. in price.

Miscellaneous News.

SOUTH METROPOLITAN GAS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company, was held at the Bridge House Hotel, London Bridge, on Wednesday last—Mr. GEORGE LIVESEY in the chair.

The SECRETARY (Mr. Frank Bush) read the notice convening the meeting; and the Directors' report and the statement of the accounts for the half year ending Dec. 31 (which were given in the JOURNAL for the 12th inst., pp. 300-1), were taken as read.

The CHAIRMAN: Ladies and gentlemen,—I suppose the fact that there is so large an attendance indicates that you expect a speech. I am afraid that these speeches of Chairmen are getting to an inordinate length; but we seem to think that we have always something to say, whether or not you think it is interesting to hear. This is the first general meeting that has taken place since the decease of our lamented colleague, Mr. Hill; and my first remark will be to say how greatly we regret his loss, what a valuable Director he was, how cordially he worked with his colleagues, and how anxious he was to promote the interests of the Company. We all feel we have lost a friend in Mr. Hill. In his place, Mr. Ewart has been appointed. His family has been connected with the undertaking since its establishment. I do not know that there is much calling for remark in the accounts. There have been very satisfactory advances in three items at any rate. The gas sold has increased by 5¼ per cent. over the corresponding half of the previous year; and coke and tar have realized considerably more. In fact, these products have yielded about £20,000 more in the half year. This certainly is satisfactory. As to coke, I am bound to say that the market has been rather puzzling. Two years ago we could not sell coke, except at extremely low prices; then suddenly the market took a turn, and last summer we had not enough coke to supply all our customers. This had rather a detrimental effect. The price of coke had to be raised, until, I am afraid, it drove away a certain proportion of our customers. They found it more economical to use coal; and now I do not think the coke market is in as good a state as it was last year. It would be better if we could maintain coke at a uniform price; but this is impossible. We, however, do the best we can, and thankfully take the profit it has brought us in the past half year, and hope we shall do fairly well this year. Tar has also gone up very considerably in value; and, as you will see, we have sold a larger proportion of our make this half-year than we did in the previous six months. We still burn a small proportion, because we do not want to get our hands out in connection with that very useful adjunct to the market. And we have sold a considerable quantity at 1½d. per gallon solely for fuel. In connection with tar, I may introduce a word in relation to cannel. It is the fact that we have decreased the quantity of cannel used; but we have not thereby diminished the quality of the gas. The gas is as good as it ever was, though we employ less cannel; but we make up the quality by preventing the tar from absorbing some of the richer light-giving constituents in the gas. In fact, I was told the other day by our tar contractor that our tar is the poorest they ever have to do with; and he told me a gentleman thoroughly conversant with tar all over the country, said he believed ours was the poorest tar throughout the kingdom; but it must be remembered that by keeping the benzols out of the tar, we are able to keep them in the gas, and are thus able to maintain the quality of the gas without using the large quantity of cannel that used to be necessary. I shall have a little to say presently about other items in the report; but I will now refer to the dividend. We are, as you will notice, on this occasion paying the full dividend we are entitled to under the sliding scale—a dividend at the rate of 13¾ per cent. per annum. This Company, I may say, has paid, I believe, the full dividend more often, and more continuously, than any other gas company. Until the last year-and-a-half, we always paid the full dividend to which we are entitled; but a year-and-a-half ago, we reduced the price of gas a 1d. per 1000 cubic feet. That would have entitled us to pay an extra ¼ per cent. dividend; but as we did not earn it, we did not think it wise to pay it. The policy of the Board is never to raise the dividend unless they are fully assured it can be maintained; because they believe it would be detrimental to the interests of the shareholders if they had to reduce the dividend. Therefore, when the price was lowered, we took care to ascertain that the increased dividend to which the shareholders would be entitled was likely to be secure before we gave it them. We think now that this extra ¼ per cent. is perfectly safe; and consequently we have resolved to recommend the declaration of a dividend at the rate of 13¾ per cent. for the past half year. Here I would say a word in reference to another matter. As to these dividends to which we have a right under the sliding scale, I may say that we consider we are entitled to everything that may come to us by the turn of the market, to everything that may accrue to us by improvements in manufacture, to all that may come to us from increase of business—whatever increase of profit may accrue to the Company from these or other sources over which we have any control, or which were thoroughly understood at the time of the passing of the Act, we are entitled to divide the full dividend which the law allows us. In regard, however, to another matter, I have quite a different feeling. The abolition of the coal dues, which is now imminent, will result in a saving of 1s. 1d. per ton on our coal. This will enable us to reduce the price of gas by 1d. per 1000 cubic feet. I say it would not be fair of us to take the increased dividend to which we are legally entitled by this reduction, because it is something that comes to us through a gift as it were on the part of the public. (Cheers.) They surrender an income from the coal dues; and we do nothing whatever in order to secure this income. I think it is highly important, when we are getting this good dividend under the sliding scale, we ought not to take the benefit of any doubt to ourselves. Wherever there is a doubt, I consider it right, as well as good policy, that we should give the benefit to the public. Therefore, your Board at the next half-yearly meeting, while legally we might be entitled to pay 13¾ per cent.—as we have reduced the price 2d. per 1000 since Christmas—will recommend a dividend of 13¼ per cent., if it is earned and if they are sure that the rate can be maintained, and they confidently expect the shareholders will approve of this course. While I am on the subject of the consumption of gas, I may say a word about fogs. People are constantly saying: "What a fine thing the fogs are for gas companies." We do not believe, however, they are good for anyone; certainly not for the gas companies. I will tell you the effect of fogs upon us. They delay the delivery of coals; steamers are delayed in the river, both up and down. One consequence is that we are involved in demurrage, because we cannot unload 10 or 15 steamers at once, which may arrive on the same day. Then we suffer in connection with the loading of steamers in the North. The coals are ready; but the steamers do not arrive. The coals consequently go elsewhere, and we have to wait, and possibly purchase coals at a higher rate, in order to stop the gap. During a recent fog, one of the steamers that we had chartered for twelve months at a very low rate had to anchor off Yarmouth, and was run into and sunk. Happily there was no loss of life; but we lost 1100 tons of coal, as we do not insure, finding it more economical to stand an occasional loss like this than to insure. We lost this coal; and we also lost the advantage of this cheap boat for the remainder of the period. Another of our cheap boats was also run into in the river in a fog. Indeed, the only effect of fog is to give an immense amount of anxiety to our Managers and Engineers, in lighting up and letting down retorts; while the advantage accruing to the Company from the increased quantity of gas sold, does not compensate for the loss we sustain in other ways. What we do like is a succession of thoroughly healthy wintry weather. Cold weather is the weather that suits gas companies; then the consumer burns the gas more extensively and regularly, and not spasmodically. We thereby benefit; and, I trust, the consumers also benefit, as they get the warmth. I now come to a matter which I would rather have avoided touching on; and that is the question of gas testing. But if I made no reference to it, it might be said that the Company feel that they are not dealing fairly or justly by the public; and therefore the least said, soonest mended. You may have seen in the newspapers that the Company has been summoned before the Magistrates, and fined 40s.; four times 10s.—two at Southwark, and two at Woolwich. Our Solicitor said: "You can do nothing before a Magistrate. The Chief Gas Examiner has disallowed your appeal; and all the Magistrate can do is to impose the penalty, which is legally 40s. for a deficiency of half-a-candle." But the Magistrate reduced the penalty to 10s. The Solicitor said to us: "You had better be quiet, and then nothing much will be said about it." We did not accept that advice, because our so doing would be an admission that we are in the wrong—that we had supplied gas of a lower quality than the Act required of us. We declined to accept any such position, as we are satisfied that we have supplied gas of the proper illuminating power. I may say it is the policy of the Company (it is our interest to do so; and therefore we take no credit for that) to supply gas of a uniform quality. If we supplied inferior gas on any day, the consumers would complain, and we wish them to be satisfied. If we gave a higher quality of gas, they would complain that it was smoky, because the burners ordinarily used in houses are not adapted to consume gas of such quality. In Scotland, where gas of a higher quality is burned, special burners are used; but if you consume high quality gas in the ordinary burner in London, you would get a smoky flame, and complaints would be made. It is therefore to our interest, and the interest of the officers, to supply gas of as nearly uniform a quality as possible—about 16¼ candles. This brings me to the question: "Gas of 16¼ candles; but who can say what a candle is?" If you take the ordinary parliamentary candle—the sperm candle, of six to the pound—it ought to burn 120 grains an hour; but it does not do so exactly. It varies up and down. It is supposed by the Act of Parliament that these candles give a uniform light; but it has been proved to demonstration by officers of the Metropolitan Board and by others—by the Gas Referees, and by everyone who has investigated it—that while one candle will give a certain amount of light, another will give a different amount; and that the same candle will vary in the amount of light given from time to time. For instance, you might on one occasion set up 15 candles, and find them equal to a given gas-flame; and by changing the candles you would find the same gas-flame equal to 18 candles. So that the vagaries of the candles, and the variations that ensue by the use of the candles, will sometimes show an apparent difference in the quality of the gas of not less than 15 or 16 per cent. Now what is necessary? One of the Referees has stated that a tester has to use his judgment in the selection of his candles—that, if a certain candle does not appear to burn properly, though burning legally right according to the Act, he changes it, and takes another. I have here a series of tests made by the testers. I have taken them at random. On one day the tests were 16·2 candles. (The tester, by the way, makes three consecutive tests in a day.) He might say: "This about accords with the quality of the gas as it appears to me by looking at the flame." His next test is 18 candles. "Oh," he thinks, "this must be wrong; this is not 18-candle gas. I must change this candle." He then takes another candle for his third test; and this comes out at 15·9 candles. By striking an average, he gets a return of 16·7 candles as the quality of the gas on that evening. Take another one. The first test is 18·7 candles. "But," says the tester, if he uses his judgment, "this candle must be wrong." He changes it. The next test comes out at 17·1 candles; and the third test at 16·1—a difference of 2·6 candles in these three tests; giving an average of 17·3 candles as the quality of the gas. I should say that 17·3 candles is rather a higher average than it ought to be. You can easily see, when we have such standards as this, that it is impossible for us to know where we are. It is as if a tradesman were measuring a certain amount of cloth; and he said: "This cloth is something like a yard wide." He takes a measure and says: "This measure must be wrong." He takes another measure, which is 3 inches shorter, measures the cloth, and says, "That is just a yard." And this is no exaggeration of what the candle test amounts to. I am glad to say that it is probable good will come out of evil. I may tell you that, as far as this Company is concerned, our own record of the tests for which we were fined—we make four candle tests a day at the testing-station, corroborated by tests of another kind—was 16¾ candles; whereas the official record was 15·4 candles—rather more than ¾ candle below the standard. The Metropolitan Board of Works are making somewhere about 2000 tests of our gas in the year. There are six testing-stations; and a test is made at each station every day in the year except Sundays. When I tell you that these deficiencies happen about once a year, you will either say that the Company supply good gas of very uniform quality; or that the gas tester exercises very sound judgment in the selection of the candles as a rule. I applied to the Metropolitan Board to give us a hearing on the matter; but they say they are acting on principle, and would not let me appear before them. We must make allowances for them under the peculiar circumstances in which they are placed; and let us hope that good will come out of evil. Yesterday, at the request of the Secretary of the Board of Trade, I attended there; and he assured me that they were quite ready to introduce a Bill into Parliament to put gas testing on a satisfactory basis. There are two or three other matters which I wish to speak about. Returning to the report, we refer to the reductions which we have made in the price of gas. We say that the price of gas has been reduced by 9d. per 1000 cubic feet since 1880—that is, in fact, 9d. in the nine years, or 1d. each year; and we say that we have effected these reductions under considerable difficulties and disadvantages. Now, there have been two cases in which Companies as large as ours have been carrying on similar work to that which we have been engaged on at East Greenwich. They were building large and new works; but during the seven years those works were being constructed, in the case of both those Companies they maintained the price of their gas—they did not reduce it; they increased it part of the time, owing to the coal famine, which gave them more than the extra price the coal came to. They did not bring down their price in those seven years. We have reduced the price whenever we could do so; and I think it is a feat of which the Company may be thoroughly well satisfied—that in the nine years we have reduced the price by 9d. per 1000 feet, notwithstanding the fact that we have been spending this large sum of money. Of the money expended at East Greenwich, I calculate that £300,000 at least is unproductive at this moment. About half of this sum is for the land; and the other half, for various

works which are enumerated in the report. In addition to the burden of this £300,000 of unproductive capital, we have also the burden of a dead loss in capital of about £60,000, incurred by dismantling the two works at Woolwich. This £60,000, we are trying to recoup partly by the sale of the sites. I think it will be regarded as satisfactory that, while we have been incurring this expenditure, we have been reducing the price of gas. Now, I put it to you: Suppose during the time we have been constructing these works, we had maintained the charge for gas at 3s., the effect of this would have been that the consumers would have paid something over £600,000 more for their gas; the shareholders would have received about £140,000 less in dividend; and a further effect would be that gas would not have been so popular as it is now. If the price of gas had been maintained at 3s., we should not have had this increase of business; and we should not have been in the prosperous position in which we now stand. This brings me to the final point upon which I have to speak. I wish to refer to the progress and prospects of this Company. People talk of the falling off in the demand for gas. They say that our increases are not so large as they used to be. I know as a fact, as far as the South Metropolitan district is concerned (and that may be taken as a fair type of South London) that the increased consumption never amounted on the average to more than 7 per cent. per annum—that is to say, that we used to double our sale of gas every ten years. Take from 1850 to 1860, from 1848 to 1858, from 1865 to 1875, you find the consumption of gas has doubled in our district in each ten years equal to 7 per cent. per annum compound. This may be taken as the increase we used to have. But I can explain that in one way. In those days, the great middle class had not adopted the use of gas. They adopted gas very gradually indeed; and by our gradual occupation of this important field, we obtained those great increases, which were far larger than the increase of buildings or the growth of population would account for. The increase of population in urban districts is something like 1¼ per cent. per annum. How is it, then, that we do not get such large increases now? Well, one very good reason is that this great field has been occupied; but we now come to another field—the lower middle class and the better class of artizans, occupying houses let at from £30 to £40 a year; and this is a field that remains for us to conquer. It is at present mainly occupied by oil; but, by reducing the price of gas, and giving the consumers every facility for its use; removing all restrictions, we have a very good prospect of occupying a considerable part of this field. Therefore we may expect an increase from this source. We have nothing to complain of in our increase of business. I have made some calculations as to the increase in our business since 1879. In that year there were three Companies—the Surrey, the Phœnix, and the South Metropolitan. They were amalgamated in 1880—the Surrey in 1879; and the Phœnix on Jan. 1, 1880. I find that the increase of business in 1880 compared with 1879 was only 3·7 per cent.; in 1881, it was only 3 per cent. over that of 1880; in 1882 the increase over 1881 was 4·6 per cent.; in 1883 the increase was 4·5 per cent. over that of 1882; and then we come to an increase of 5 per cent. I need not trouble you with all these increases in detail; but in the first four years of this period—from 1879 up to 1883 (I leave out the year 1884, in which we absorbed the Woolwich Companies)—our business increased by 16·86 per cent.; whereas in the four last years, the business has increased 25 per cent., or half as fast again. In fact, therefore, we are now going ahead again. The slack time was about 1881, when we were as low as 3 per cent. in our increase; and now, during the last four years we have averaged nearly 6 per cent. It is not fair to take a single year, because the weather has so much to do with it. I will give you the last five years—5·9 per cent. in 1884; 5·4 per cent. in 1885; 6·6 per cent. in 1886; 5·6 per cent. in 1887; and 5 per cent. in 1888, which is very good considering that mild weather prevailed in the winter months. In the first four years, the increase averaged 144 million cubic feet. In the last four years the increase averaged 274 million cubic feet, or very nearly double. Now this increase is a very great thing for us. I may take it we should not have an increase of much less than 300 millions a year. This 300 million cubic feet of gas a year means a considerable addition to our profits, because the new business brings in a larger profit per 1000 feet than the old business. The old business may be taken to give us a profit of 1s. per 1000 cubic feet; the new business a profit of 1s. 3d. Each 100 millions, therefore, should in the year increase our profit by something like £6000 a year. But what does it cost us to meet this? Say our increase is 300 million cubic feet, that would be £18,000 a year of extra profit; but we should spend between £50,000 and £60,000 to make the gas and lay the mains to supply those 300 million cubic feet of gas. But this £50,000 or £60,000 will only cost us in interest £2000 a year; so that, while the increased business gives us an increased profit of about £18,000, the expenditure of capital will reduce this amount by £2000. Therefore, we have a clear gain of, say, £15,000 a year from the increased business alone; and this £15,000 we are very happy to give to the consumers, taking only the small share to which we are entitled under the sliding scale ourselves. I am much obliged to you for your great patience in listening to me for so long; and I have to move—"That the report and accounts now presented be received and adopted, and the report entered on the minutes."

Mr. J. Ewart, in seconding the motion, thanked the proprietors for the honour they had done him in electing him a Director last December. It was satisfactory to note the steady progress and prosperity of the Company, and to know that it rested on a broad and substantial foundation. They enjoyed the goodwill of the public, owing mainly to the steady reductions which they had made in the price of gas from time to time; and one of the advantages of this proceeding had been to discourage the competition of other systems of lighting of which so much was heard.

The motion was adopted unanimously.

The Deputy-Chairman (Mr. John Mews): The next resolution to be submitted is that respecting the dividend; and I think, though it is not a large one, you will say that the increased dividend is most acceptable. I move—"That a dividend at the rate of 13¼ per cent. per annum be now declared, and that such dividend, with the exception of the sum of £93 15s., be apportioned amongst the three classes of stock as prescribed by the Scheme of Amalgamation 1880; and that the warrants be transmitted to the registered addresses of the proprietors by post."

Mr. Simpson Rostron seconded the motion, observing that the additional dividend had been honestly earned, and that the proprietors were fully entitled to it.

The motion was unanimously adopted.

The Deputy-Chairman: It devolves upon me, and it is a very great pleasure to me, to propose the re-election of Mr. Livesey. I am quite sure that I need say nothing to induce you to re-elect him. He has addressed to you a very masterly speech, and shown you the affairs of the Company in such a way that I believe there is no one here who has heard what he has said who has not understood what he wished to convey; and I am sure you will be pleased to support the motion that I now make—"That Mr. George Livesey be re-elected a Director of this Company."

Mr. H. Butler, in seconding the motion, said he did not think that such a statement as had been placed before the meeting could have been made except by an expert. Mr. Livesey was considered the best gas authority in the world; and they were very fortunate indeed in having such a Chairman.

The motion was carried unanimously.

The Chairman: Ladies and gentlemen,—It is, I can assure you, a very great pleasure to me to see this vote carried in the way it has been. The greatest satisfaction that I can receive is to be assured of your approval. You have shown this on many previous occasions, but never more than on the present one. I thank you very heartily for it. I do not want to take any special credit myself for the prosperity of the Company. I am supported loyally and thoroughly by a number of very able colleagues—gentlemen who are good men of business, and devoted to the interests of the Company; and I think it is this cordial pulling together, and the able support we receive from the officers, from the highest to the lowest, that enable me to stand before you in this pleasant position to-day. I have now very great pleasure in proposing the re-election of my colleague Mr. Robert Owen White. I do not know that I can say too much in his praise. He is a gentleman thoroughly conversant with business, and has been for a long time connected with gas. We appreciate very highly the services he is able to render us on the Board. Moreover, he works with us in the same loyal and cordial manner that animates every member of the Board. I have great pleasure in proposing his re-election.

Mr. Champion seconded the motion, which was unanimously agreed to.

Mr. White having briefly acknowledged his re-election,

On the motion of Mr. Morris, seconded by Mr. A. G. Hounsham, the retiring Auditor (Mr. W. Westcott) was re-elected.

Mr. Franklin then proposed a vote of thanks to the Chairman and Directors for their able conduct of the Company's business. The report presented to them on that occasion, he said, was very satisfactory; and the explanation of the Chairman had been so masterly that the whole body of the shareholders had been satisfied, and not a single question had been put.

Mr. Soden, in seconding the motion, observed that it was the most gratifying report the proprietors had ever received; and the explanation of the Chairman was most satisfactory—so much so that it did not draw forth a single criticism. He therefore thought it might be assumed that the proprietors thoroughly endorsed the action of the Directors in reducing the price of gas, owing to the expected abolition of the coal dues; and that they agreed with the Chairman that the benefit of the abolition should go to the consumers. (Cheers.) He considered the Directors were adopting a wise course.

The motion was carried unanimously.

The Chairman: I have to thank you on behalf of the Board as a whole; and I can only repeat what I said before—that it is a great encouragement to us, and satisfaction to us, to find that our labours are so well received by the shareholders. We are interested in the Company, and are certainly determined to do the best we can to forward its prosperity in every possible way. You may rest assured that we shall continue to do this, and not the less for the hearty votes you pass from time to time, encouraging us in our work. There is one other thing I must say. It is usual at these meetings to accord a vote of thanks to the officers. Now it is upon the officers that the strain or pressure comes. These reductions in price that have taken place are very satisfactory to the shareholders, as they get an increased dividend, and satisfactory to the Directors, in improving the position of the Company; but they entail hard work on the officers. It has been tight-collar work in these years for the officers; and I feel that it would not be right if their services were not acknowledged. Whenever there is any pressure or difficulty, the first strain or burden comes upon them. I may say, for the Engineer and those under him, and for the Secretary and those under him, and for all the staff of the Company, that they are ever ready to put their shoulders to the wheel, and do their duty under all circumstances; and I have therefore the greatest possible pleasure in proposing a vote of thanks to the Engineer, Secretary, and officers.

Mr. Howlet, in seconding the motion, said he came in contact with the officers of the Company in a business capacity; and he could only say that they were really good fellows, and the right men in the right place. He did not think that any Company in the Metropolis, of whatever description it might be, was better officered than the South Metropolitan Gas Company; and he considered the test of their capacity was shown in the progress of the Company.

The motion was carried unanimously.

The Chief Engineer (Mr. Frank Livesey): I thank you very heartily for the vote you have passed; and for myself and those included in the vote, I may say we appreciate very much indeed this expression of confidence in us. In the future, we cannot see much prospect in the reduced cost of materials; but we may get something from the increased value of residual products, and also from improved working. I hope we shall be able to show some result in this respect, and then we shall merit once more your approval.

The Secretary (Mr. Frank Bush): I too thank you very much indeed for the vote you have just passed. It is very pleasing to us to witness the prosperity of the Company, and to know that our work meets with your appreciation.

Tottenham and Edmonton Gas Company.—The ordinary meeting of this Company was held last Saturday, when the Directors' statement for the past half year (which was noticed in the Journal last week, p. 352) was accepted by the shareholders, on the motion of the Chairman, Mr. G. Gripper, seconded by the Deputy-Chairman, Mr. J. Malcolm. In the course of the proceedings, Mr. Corbet Woodall mentioned that the Directors were looking forward to an early further reduction in the price of gas. A report of the meeting will be given next week.

The Burnley and Padiham Water Bills.—The Burnley Corporation and the Padiham Local Board are both promoting Improvement Bills in the ensuing session; and unless an understanding is arrived at in the meantime, they are likely to be brought into sharp conflict in the Committee rooms. Both bodies are claiming to include in their areas of water supply the district of Lowerhouse, which lies on the border land of their present boundaries. The matter has given rise to considerable discussion, and has led to some display of feeling between the two authorities. At the meeting of ratepayers to authorize the Burnley Corporation's opposition to the Padiham Bill, replying to a question, the Mayor (Alderman Greenwood) said he believed that the Padiham gathering-ground was very much in excess in proportion to the population, as compared with the Burnley gathering-ground. He believed that Padiham would have, when they had completed their water-works, about 144 million gallons storeage and a population of 16,000 to supply. Burnley had at present nearly 200 million gallons of storeage; and when Cant Clough was completed, they would have a total storeage of 460 million gallons, and a population of about 85,000 to supply. The resolution approving of opposition to the Padiham Bill was passed.

LIVERPOOL UNITED GASLIGHT COMPANY.

The Half-Yearly General Meeting of this Company was held last Tuesday—Mr. E. LAWRENCE in the chair.

The SECRETARY (Mr. P. F. Garnett, J.P.) read the report of the Directors, in which they recommended dividends at the rates of 10 and 7 per cent. per annum on the two classes of the Company's stock.

The CHAIRMAN, in moving the adoption of the report and the declaration of the dividends recommended, said the meeting was of a very formal character. The Directors had no figures of any kind to present to the shareholders; but on those which had been laid before the Board, showing what the working of the Company had been for the half year ending Dec. 31 last, they felt authorized in submitting a resolution proposing the usual dividends. He might say this much more—that the accounts for the six months were about the most satisfactory that were ever presented to the Directors; and he thought it was right that the shareholders should know this, particularly at the present time when competition in reference to the supply of illuminants was so great. Of course, they could not walk through the streets of Liverpool at the present time without seeing the wires being laid down to compete with the Company for the privilege of supplying the inhabitants of Liverpool with light; and what the Directors felt, and what he was sure the shareholders would all feel, was that their only way of securing the safe position they had so long held, was to do everything in their power to conduct the affairs of the Company with economy, and supply the public with cheap light. This, he thought, there was every prospect of their continuing to do. If it were impossible to say what Science might do in the way of providing fresh and economical modes of illuminating, it was equally impossible to say what Science might do in improving the old modes. If Science was being called in aid of the new modes, it was also being called in aid of the old ones; and, from what he had seen and knew, he considered they had every reason for hoping that, before long, means might be found by scientific men to materially cheapen the price of gas. He mentioned this because he thought it was right that the shareholders should know that the competition was not all on one side, and that the Company would be able to compete with others in supplying the public with an economical illuminant. During the half year, he thought, everything had been done, as far as regarded the interests of the shareholders, that possibly could be done by the officers who had charge of the various departments. The Directors had every reason to feel that economy had been practised in every department; and that, owing to the efficient services rendered by the officials, the present position of the undertaking had been attained. They looked forward to improvement, because no doubt the Company would feel the improvement in trade which was being experienced everywhere; and if the electric light was in some instances taking the place of gas—and he could not deny that it was—it had not interfered so far with the consumption of gas in Liverpool, which in the past six months had been greater than during the corresponding period of last year. He thought these facts would be satisfactory to the meeting; and whilst the Directors were doing everything they could in the interests of the shareholders, the public might feel assured that they were doing all they could to secure for them a cheap illuminant.

Mr. H. B. GILMOUR seconded the motion.

Mr. G. H. BALL remarked that with the improvements which were now taking place in the manufacture of gas, and with economical management, gas would be able to compete with any illuminant yet put forth. The electric light might be used as a luxury; but gas would be the great staple illuminating medium of the future.

The motion was carried unanimously.

A vote of thanks was then accorded to the Chairman and Directors, and the proceedings closed.

BRISTOL UNITED GASLIGHT COMPANY.

The Half-Yearly Meeting of this Company was held last Tuesday—Mr. J. L. STOTHERT (in the absence of the Chairman, Mr. S. Jones, by direction of his medical adviser) presiding.

The SECRETARY (Mr. J. V. Green) read the advertisement calling the meeting; and the report of the Directors (see *ante*, p. 300) was taken as read.

The CHAIRMAN, in moving the adoption of the report, congratulated the shareholders on the satisfactory character of the balance-sheet. Before making extended reference to the conditions that had conduced to the present prosperous state of the Company, he desired to refer to a certain statement that had been made as to the mysterious disappearance of £32,000; and he should ask the Secretary to read the report of the Auditors which had been drawn up with regard to this particular amount.

Mr. GILES said he should like to ask whether it was worth while attaching so much importance to a newspaper paragraph. No proprietor had ever suggested that there had been any mysterious disappearance of £32,000. Every proprietor knew perfectly well that the £32,000 had been drawn from the reserve fund to make good certain revenue deficiencies during past years.

The SECRETARY read the report, in the course of which it was stated that the accounts were perfectly regular and straightforward, and were fully set out in the half-yearly accounts sent to the shareholders. The misleading statements that had appeared seemed to be based upon the withdrawal of certain amounts from the reserve fund, for the purpose of making up the dividends—the very purpose for which this fund was allowed by Act of Parliament. The diminution in the reserve was caused by the reduction in the price of gas in 1883, which resulted in a temporary loss of income, as on previous occasions. This had gradually been rectified by the natural increase in the consumption of gas, till the corner had been turned; and now there was again a considerable surplus of revenue beyond the amount required to pay the usual dividend. The revenue had also been increased by a rise in the price of residual products, in which there had been previously a considerable fall.

The CHAIRMAN (continuing) said the Directors thought that the article in question, which appeared in the *Bristol Mercury*, was so exceedingly damaging to the credit of the Company, and so likely to depreciate the value of the property, that they had instructed their Solicitors to take Counsel's opinion on the point; and if the opinion of Counsel was that it was libellous, they would then take such steps as they might be advised. Turning again to the report, he said that they had been exceedingly fortunate in purchasing their coal this year. Though they had used 1500 tons more, the cost had been £700 less than in the corresponding half of last year. They had also made a contract for tar at a considerable advance upon the prices hitherto obtained; and they had sold their coke very well—the average price obtained being 6s. 1d. per ton, which was a considerable advance upon former prices. They had also been very fortunate in the choice of their Secretary; and he could not too highly commend the great zeal he had shown in all matters connected with the Company. They had also to congratulate the shareholders upon the small quantity of bad debts, which only amounted to £147 for the half year, and which was perhaps the lowest percentage of any town in England. Besides this the illuminating power of the gas had been increased from 13½ candles, which was the standard provided by their Act, to 17 candles. They had also reduced the hire of meters; and they had found that this had encouraged a larger consumption of gas, especially amongst the working classes. He might mention that it was intended by the Directors, if the price of coal was not increased, to reduce the price of gas at June next. He concluded by moving the adoption of the report and accounts.

Mr. JONES seconded the motion.

Mr. GILES moved, as an amendment—"That the report of the Directors be received, but that it be not adopted by this meeting, and that the statement of accounts be received and adopted." After stating that he intended to resign his seat on the Board, though he should do it in the way he thought most conducive to the interests of the Company, he remarked that the proprietors and the public had been made aware of the unhappy differences which had prevailed between him and the Directors.* He denied that with him it was a question of personal difference. When he found there was a determined action against him upon the Board to reduce him to silence and impotence, or to force him off the Board, he had been obliged to resist. The first clause of the report congratulated the proprietors upon the increased prosperity of the Company. The shareholders might admit the increased prosperity of the Company; although he scarcely thought the phrase, "the increasing prosperity of the Company's affairs," was quite appropriate. He said, in March, 1887, that it was perfectly possible to economize £18,000 a year by better management; but the Directors said the management was all that could be desired. The accounts for 1888 showed that exactly £18,304 had been saved on the item of manufacturing expenses. The report also attributed the improved finances in a great measure to the enhanced prices realized for coke and tar, and to the purchase of coal and other material upon advantageous terms. The improved sales of coke were largely due to the action of the Secretary. He was sorry to say there had been no improvements in the works for the last 25 years; but a great saving had been made by having tenders for the materials they purchased. The Directors took credit for making a reduction in the meter hire; but as far back as June 5, he moved that the rent of meters should be reduced. The Board, however, would not then entertain the proposition. He renewed the motion on Sept. 4; but the Board still objected. On Sept. 25, the Board ordered the reduction to be made. When therefore the Board appealed to their successful management as a reason for which the proprietors should give them their confidence and follow their lead in expelling him from the Board, it was only fair to remember that he had had an equal share in making these improvements. He protested against the policy of announcing six months in advance that they intended to lower the price of gas; and then he went on to contend that the policy of the Board had been most unwise. Proceeding, he inquired under what power the Board invited the meeting to expel a Director. He did not deny that the meeting had power to reduce the number of Directors; but that power must be exercised in good faith, and it could not be made a pretext for expelling a Director to gratify the caprice of his colleagues.

The CHAIRMAN said if the statements of Mr. Giles were made before a Committee, the Directors would be perfectly prepared to discuss the matter with them.

Mr. GILES said if he had known that a Committee would have been granted, he would not have said a word about the matters referred to. Continuing, he said the reasons given for asking him to resign his seat were a marked want of respect to the chair, disagreement with his colleagues at large, and a determined resistance to accepting the decisions of almost unanimous majorities. He wrote asking the Board to specify the facts on which they based their statements; but he only received formal acknowledgments of his letters, and stating that they would be laid before the Board. He asked what he had done to merit this treatment.

Mr. ALLIS seconded the amendment.

Mr. DIX said, if the amendment should be carried, he should move another that the report be received and adopted, with the exception of the clause referring to Mr. Giles.

Mr. GILES expressed his willingness to withdraw his amendment in favour of that proposed by Mr. Dix.

This was agreed to; and it was afterwards adopted as the substantive resolution.

Mr. MEDWAY then proposed the re-election of Mr. G. K. Stothert, one of the retiring Directors.

Mr. JONES seconded the motion.

Mr. GWYNN moved, as an amendment—"That the election of Mr. Stothert be deferred until the future number of the Board has been determined."

Mr. BOUCHER seconded the amendment.

Mr. GILES thought the amendment should be carefully considered. He was anxious to know what was the real object of reducing the number of the Directors from nine to eight—whether it was a pretext for turning him off the Board, or whether he was to be turned off because, as a matter of policy, it was thought desirable to reduce the number of Directors.

The CHAIRMAN, before putting the amendment, said they had now come into distinct conflict; and he might at once say that the Directors had proxies to the extent of 1607 votes. Mr. Giles had 390 proxies; so that the Board had four times the number held by him.

Subsequently, the motion was carried.

Resolutions were also passed re-appointing the other retiring Directors (Mr. J. L. Stothert and the Rev. P. R. Sleeman) as well as the Auditor (Mr. H. Grace).

The CHAIRMAN said Mr. Giles had informed them that day that if the Secretary had told him that the Directors would consent to a Committee of Investigation, it would have altered his whole course of proceeding. It was no part of the Secretary's duty to do this; there being no absolute resolution about it. A circular had been issued, signed by Mr. Richardson and others; and as the votes on that circular represented between £40,000 and £50,000 of stock in the Company it was entitled to very serious consideration. He must ask Mr. Richardson what he meant by the second paragraph in the circular, which was as follows:—"It appears that Mr. Giles, who was elected to the Board by the proprietors in September, 1887, in consequence of the alarm and dissatisfaction felt at the continued revenue deficiencies, whereby upwards of £32,000 had been abstracted from the reserve fund, considered it his duty to bring certain charges of improper conduct against the Chairman of the Company, and intimated that unless he (the Chairman) should be induced to retire from the Board, Mr. Giles would place his own resignation in the hands of the proprietors, with the full explanation of the circumstances leading to that step. The Chairman did thereupon resign the chair; but not having vacated his seat as a Director, it has become necessary to place the matter before the proprietors."

Mr. RICHARDSON remarked that it meant just what was said. The statement as to the £32,000, he took from what Mr. Giles informed him; and the Provisional Committee thought that Mr. Giles gave them sufficient reasons for warranting a Committee of Inquiry.

The CHAIRMAN said the Directors would be very pleased to agree to a

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* See *ante*, p. 164.

Committee of Investigation; but, of course, it must be on certain terms. He had drawn up something which he hoped would be approved, and which was as follows:—"The Board will be very pleased to agree to an investigation as suggested by the circular issued by the Provisional Committee; but they decline to submit the matters to be dealt with to any Committee or person connected in any way with the Gas Company, except inso far as may be necessary for the pur poses of giving evidence. They propose a Referee (who shall be a Counsel) to be mutually agreed upon by the Board and the Provisional Committee; but, before this step takes place, the terms of the reference to him must be defined, and agreed between the Provisional Committee and the Board." It was necessary, he continued, to have an absolutely independent Referee; and if matters extending over a long series of years were gone into, the expense would be enormous, and no beneficial results would be obtained.

Mr. RICHARDSON said he had prepared the following resolution, which he proposed:—"That a Committee be appointed, who shall be empowered to hold an official inquiry into the administration of the Company, and into the differences which have unhappily divided the Board; and that the said Committee be authorized to take the evidence of any Director, officer, or servant of the Company, and to have access to all books and documents in the possession of the Company at the discretion of the said Committee; that the Directors be requested to place their resignation in the hands of the Committee pending their investigation; and that the said Committee be requested to report their conclusions, at as early a date as may be conveniently possible, to a general meeting of the Company to be specially convened for that purpose."

Mr. EXLEY seconded the resolution.

The resolution, on being put to the meeting, was rejected.

The CHAIRMAN said the Directors were anxious that there should be an investigation; and if the members of the Provisional Committee would confer with the Directors, they would be very pleased to try and meet their views. Continuing, he proposed—"That, in accordance with formal notice convening this meeting, dated the 4th of February, it is hereby resolved that Mr. Richard William Giles, one of the present Directors, be and hereby is removed from his office as a Director of the Company, and that the number of the Directors of the Company for the future be reduced from nine to eight."

Dr. HIGHETT seconded the resolution.

Mr. GILES asked for some specific information as to the reasons why he was to be expelled from the Board—a course which inflicted a shameful stigma on his name.

The CHAIRMAN said the Board asked Mr. Giles to resign, and he declined. In their opinion, he had throughout shown a want of loyalty to his colleagues. He had shown a perfect independence of action; and he had declined practically to work in harmony with his colleagues in any way. The question for the meeting was whether they would practically lose the whole of the present Board, or whether they would accept the management of Mr. Giles.

Mr. GILES having replied,

A division was thereupon taken, when 38 votes were recorded for the resolution, and 39 against it.

The CHAIRMAN said he should, of course, put in the proxies.

Mr. GILES protested against the use of the proxies, on the ground that they were given without knowledge of the fact that it was intended to expel him.

The CHAIRMAN then declared the resolution carried.

A dividend at the rate of 10 per cent. per annum was agreed to, and a vote of thanks to the Chairman closed the meeting, which occupied four hours and a quarter.

CROYDON COMMERCIAL GAS COMPANY.

The Half-Yearly General Meeting of this Company was held last Wednesday, at the Offices, Katharine Street, Croydon—Mr. CHARLES NEWTON in the chair.

The SECRETARY (Mr. W. J. Russell) read the notice convening the meeting; and the Directors' report and accounts for the half year ending Dec. 31, which were summarized in the JOURNAL last week (p. 352), were taken as read.

The CHAIRMAN moved—"That the report of the Directors and the accounts for the half year ending the 31st of December, 1888, showing a balance of £18,086 17s. 3d. available for dividend, be received and adopted." He said that he should except from the report the paragraph relating to the number and remuneration of the Directors, as it was a matter of some importance, and should receive special consideration. He proposed, therefore, that this paragraph should not be embodied in the resolution now before them, but that it should be brought forward at a later stage of the proceedings. The report that he had to submit to the shareholders was one, he thought, that they would join with the Directors in thinking exceedingly satisfactory. The progress of the Company had been such as to show an increase in the quantity of gas consumed of something like 8 million cubic feet; and, notwithstanding the loss in the revenue of nearly £500 consequent upon the previous reduction in price, the Board had, owing to this increase in the sale of gas and the better revenue derived from residuals, felt themselves in a position to do two things which he shadowed forth at the last meeting—one was an announcement of a further reduction in the price of gas; and the other was an increase in the dividend. It was proposed to reduce the price of gas at the end of the current quarter to 2s. 11d. per 1000 cubic feet; and although they were not in a position to say that they would in the course of time be able to again reduce it, he had strong hopes that they would see their way clear to go on lowering the price as the sale of gas increased. It would be seen that, notwithstanding the payment of an increase of 1 per cent. in the dividend and all the charges incident to it, they were able to carry forward a balance of about £600 to the undivided profits beyond that brought forward at the commencement of the half year. As the loss upon this half year through the reduction in the price of gas would only amount to £250, in the summer quarter they would be in a position to meet that, and carry over £350 more than was brought forward. The items in the accounts did not require any remarks from him on the present occasion; and he would rather avail himself of the opportunity of taking a review of the past. He thought he should be able to show that the progress of the Company had been satisfactory. He had made some calculations in regard to the years from 1873 to 1878, and from 1883 to 1888; but as the figures for the first-named five years were almost similar to those for the years 1883 to 1888, he should restrict himself to the latter. The points that he had taken for comparison were (1) as to the capital raised; (2) the quantity of gas sold; (3) the price charged for gas; (4) the amount of profit made; and (5) the rates of dividend paid. In 1883 the capital of the Company was, in round numbers, £212,000; in 1888, £213,600—a difference of only £1600. The usual and simplest mode of calculating whether the capital of a Company was moderate or excessive was to ascertain the proportion of capital employed to the ton of coal carbonized. For each ton of coal carbonized in 1883, the capital required was £8 1s. 1d.; in 1888, £5 15s. 10d.—or a decrease in the five years of £2 5s. 3d. The effect of this was: That, whereas in 1883 they had to take out of the profits a sufficient sum to pay a dividend upon £8 1s. 1d. for every ton of coal carbonized, in 1888 they had only to take sufficient to pay a dividend upon £5 15s. 10d. When the quantity of coal the Company now used was considered (nearly 19,000 tons in the half year), the shareholders could judge how much less profit was required to pay the dividend in proportion to the capital; and all this went to benefit the consumers. The next point was as to the quantity of gas sold. In 1883, the amount was 271,600,000 cubic feet; in 1888, 369,700,000 feet—an increase of 98,100,000 feet in five years; or equal to an average of 7 per cent. per annum. He believed in most provincial companies 5 per cent. was reckoned a very high increase per annum; but he was glad to say their Company showed a growth per year of 7 per cent. In regard to the price paid for gas, in 1883, it was 3s. 6d.; in 1888, 3s. It was rather singular that in 1872 the price was 4s. 6d.; in 1878, it was reduced to 4s.; in the next five years to 1883, it was reduced to 3s. 6d.; and in the following five years, to 3s. It would be noticed that there had been a gradual reduction of 6d. every five years. Whether the Company would be able to continue making reductions at this rate every five years, he was unable to say. In 1883, the profit was £18,273; in 1888, £21,385—an increase of £3112, notwithstanding the reduction which had taken place of 6d. per 1000 feet, and which was equal to a saving to the consumers of something like £16,000 a year. In regard to the rates of dividend, in 1883 they had 12 and 9 per cent.; and in 1888, 14 and 11 per cent. These results indicated the satisfactory progress which the Company had made. It was just possible that some shareholder might say: "You tell us so much as to the past, what about the future?" Well, he was not a prophet; and therefore he could not predict what the next five years would bring forth. However, from what he at present knew in regard to the extended use of gas in Croydon for heating and motive power, and with the determination of the Directors to keep the capital from increasing as much as they could—to bring it down, in fact, to £5 per ton of coal carbonized—he had every reason to think that the Board in 1893 would be in a position to submit to the shareholders as satisfactory a statement of accounts as the Directors had to do on the present occasion; and he believed the then Chairman would be able to repeat what he thought he might now truthfully say, that the shareholders were the possessors—and he believed it was generally acknowledged to be so—of one of the most prosperous and flourishing provincial gas undertakings in the kingdom.

Mr. W. HYSLOP seconded the motion.

Mr. PELTON observed that nothing was said in the report, nor had been mentioned in the Chairman's speech, respecting the saving that would result from the abolition of the coal and wine dues; and he should like a little information on the point. He went on to congratulate the Chairman on the statement of affairs that he had been able to place before the shareholders; but there was one matter which he should like explained. It was this: That every one of the Gas Companies round about them, without exception, charged a considerably less price than they did, and yet kept up their dividends, paid the Directors, and maintained their concerns in a prosperous condition. The South Metropolitan Gas Company were charging 2s. 5d.; the Crystal Palace Company were considerably below Croydon; and at Bromley the price was 2s. 6d. These Companies promised a reduction on the cessation of the coal dues. The Chairman had stated that in 1883 the capital per ton of coal carbonized was about £8; and in 1888, £5. In that period the price of gas had been reduced from 3s. 6d to 3s. Comparing these figures, the capital employed per ton of coal had been lowered from 8 to 5; whereas the price of gas had only gone down from 7 to 6. There was a large margin here; and he should like an explanation of the discrepancy.

Mr. HALE called attention to the fact that in the accounts for the preceding half year the cash at the bankers was £8950; while in the present statement it was only £1964. In the previous accounts the debtors to the Company were given as £9700; and this half year he found they were as much as £19,200.

The CHAIRMAN, in reply, said, with reference to the coal and wine dues, that if all the circumstances remained exactly the same when they were taken off as at the present time, the Company would have the benefit perhaps of 1s. per ton of coal; but the reduction in the price of coal to the general public would have an effect upon the price they would realize for coke, and upon coke they depended at the present time for a large portion of their profits. He believed coal was now 1s. per ton dearer at the pit's mouth; and there was every probability that it would not come down again to the price of a year or two ago. Therefore he did not think they would be able to take the whole of the advantage of the 1s. per ton, because he was afraid that the counteracting disadvantages would operate against it. With regard to the price of gas, companies differently circumstanced could not be fairly compared. For instance, the South Metropolitan Company, he supposed, for every mile of main they possessed, would take about £1000; whereas in Croydon they took something like £100. They were also enabled to get coal at a much cheaper rate; and as they dealt in millions, it must be obvious to any person that the proportion of expenses was a great deal more in a small company than in a large one. In reference to the prices round about them, at Bromley 3s. 6d. was charged (not 2s. 6d. as stated by Mr. Pelton); and it was, he believed, to be reduced to 3s. At Sutton the price was 4s., subject to 6d. discount; and at Carshalton it was 4s. 6d. It was just as unfair to say how cheap the gas was in comparison with Sutton or Carshalton, as to compare it with the South Metropolitan or Crystal Palace Companies. He was afraid that Mr. Pelton misunderstood the statement as to the capital used per ton of coal carbonized. He (the Chairman) said that whereas in 1883, they had to take out of profits such a sum as would pay a dividend upon £8, in 1888 they had to pay a dividend on only £5 15s. The dividend upon the £8 1s. 1d. was equal to 1s. 7¾d. per 1000 cubic feet of gas sold; and upon £5 15s. 10d., to 1s. 1¾d. He was perfectly sure that there was no company in England, similarly circumstanced to their Company, that sold gas at less price than they did. In reply to Mr. Hale, he said that the figures in the accounts should be compared with the corresponding half year, and then he would see that there was very little difference.

The motion was unanimously carried.

On the proposal of the CHAIRMAN, dividends were declared for the half year at the rate of 10 per cent. per annum on the capital of £51,600, and of 7 per cent. per annum on the capital of £137,000, and an additional dividend, under the sliding scale, at the rate of 4 per cent. per annum, all less income-tax.

The CHAIRMAN then alluded to the resolution passed at the February meeting last year, to the effect that the question of the remuneration of the Directors and their number should be referred to the Board for them to consider, and to report to the present meeting of shareholders. He said, as would be seen by the report, the Board recommended that, as vacancies occurred, their number should be reduced to six, and that from the 1st ult. each Director should be paid a fixed sum of £200 per annum. These matters would be taken under separate resolutions; and he would first propose—"That, as vacancies occur by death or resignation, the number of Directors be reduced to not less than six."

Mr. PELTON seconded the motion.

Some discussion ensued, in the course of which certain of the speakers

expressed the opinion that, as the Company had been prosperously conducted by a Board of eight gentlemen, that number should be retained.

The CHAIRMAN pointed out that the Directors were only requested to report on the matter at the present meeting; and their Solicitor (Mr. E. K. Blyth) advised him that, unless the vote was unanimous on the present occasion, the resolution would not be valid. As there was some divergence of opinion in the room, he did not think the matter should be proceeded with; and he would give notice that he would bring the resolutions forward at the next meeting.

The retiring Directors (Messrs. H. Chasemore, A. J. Lambert, and J. S. Wright) and Auditor (Mr. A. Twentyman) were re-elected.

On the motion of Mr. HYDE, seconded by Mr. MARSHALL, a vote of thanks was accorded to the Directors and officers of the Company for the zealous way in which they attended to the Company's affairs.

The CHAIRMAN, in responding to the compliment, suitably acknowledged the loyal manner in which the Board were supported by the officers.

The proceedings then terminated.

IPSWICH GASLIGHT COMPANY.

The Half-Yearly Meeting of this Company was held yesterday week—Mr. S. WESTHORP in the chair.

The CHAIRMAN moved the adoption of the report and accounts, an epitome of which was given in the JOURNAL last week (p. 349). In doing so, he said he thought the shareholders might congratulate themselves upon the general tenor of the report, not only as regarded the present position of the Company, but also in respect to its future prospects. It had been hinted that the Directors had been frightened into reducing the price of gas by the present or coming competition. He assured them it was no such thing; they had done it on the common principles of commerce. They had provided the public with a cheaper article; and they had thus obtained for the shareholders a larger dividend. They commenced reducing the price of gas in October, 1886; and the fact that in three-and-a-half years they had lowered it from 3s. 6d. to 2s. 10d. per 1000 cubic feet, and at the same time had increased their dividends, was, he thought, very satisfactory. As to the Company's new sulphate-house, it had already been productive of an increase in the receipts amounting to £408; and they hoped for still further profits from this source in time to come. By relaying some of the mains, they had decreased the leakage very considerably. It was now 6·57 per cent., which, taking the average leakage of other companies, was very low. Referring to the question of the lighting of the public streets, the Chairman contended that it was impossible to light the town with burners passing only 3½ cubic feet of gas per hour. The Company had decreased the price of gas, and the Corporation had largely increased the consumption; but, as a matter of fact, they were not paying as much now as they did when the consumption was less. He hoped the Council would adopt the suggestion of which notice had been given by one of the members, and order the whole of the lamps in the town to be supplied with 5-feet burners. With regard to the residuals, he was thankful to say they had tided over a period of depression, and he thought they might hope for an improved trade in this department in the future.

Mr. BIDDELL seconded the motion.

Mr. JEFFRIES congratulated the shareholders on the marked improvement in their property. He said he was glad to find that the agitation he had kept up so long in favour of cheaper and better gas had not been altogether futile. Some of the suggestions he made years ago were characterized as ridiculous; but nearly the whole of these suggestions had since been adopted by the Directors. He should not, however, be satisfied until the Company supplied 16-candle gas at 2s. 6d. per 1000 cubic feet, which he was thoroughly satisfied they could do. He did not blame the Gas Company for the insufficient light in the public streets. The gas was good enough; but the authorities were endeavouring to light three miles of streets with a quantity of gas which was only sufficient to light two miles. Concerning the proposed addition to the remuneration of the Directors, he did not think, in the face of the opposition from the electric light, that this was the proper time to ask for an increase.

The CHAIRMAN said that Mr. Jeffries talked a great deal about 16-candle gas; but he should like to state that the average of the gas supplied during the past year had been 15·90 candles, so that they were getting very near to Mr. Jeffries' standard. He could not call to mind any suggestion of Mr. Jeffries which had induced the Directors to adopt the policy they were now pursuing.

Mr. FRASER considered that the report was extremely satisfactory; but with regard to the proposed increase in the remuneration of the Directors, he agreed with Mr. Jeffries that that this was an inopportune moment to bring the matter forward.

The motion was agreed to.

On the motion of the CHAIRMAN, seconded by Mr. BIDDELL, it was resolved—"That a dividend of 12s. per share upon shares class 'A,' 9s. 6d. per share upon class 'B,' and 9s. per share upon shares class 'C,' be paid on and after March 1 next; making, with the interim dividend paid in September last, a dividend of 11 per cent. per annum upon shares class 'A,' 8½ per cent. per annum upon shares class 'B,' and 8 per cent. per annum upon shares class 'C.'"

The retiring Directors having been re-elected,

Mr. MILLER proposed that the remuneration of the Directors be increased to £400 a year. He remarked that he was sure the proposal would meet with the approval of the shareholders, even though there were a few dissentients there. It was now thirteen years since any alteration was made in the remuneration of the Directors; and since that time the capital of the Company had grown from £76,000 to £115,000, and the coal consumed had increased from 11,000 or 12,000 tons to between 16,000 and 17,000 tons. The great prosperity which had attended the Company was due to the efficient way in which the business had been managed by the Directors; and he maintained that the remuneration they had hitherto received was quite inadequate.

Mr. READ seconded the proposal.

Mr. FRASER proposed, as an amendment, that the question be deferred until the next meeting.

Mr. JEFFRIES seconded the amendment.

On being put to the vote, the amendment was lost, and the original resolution was agreed to.

Votes of thanks to the Directors and to the officers terminated the proceedings.

CORK GAS CONSUMERS' COMPANY.—The half-yearly meeting of this Company was held yesterday, when the Directors reported a slight increase in the private consumption, but a falling off in the amount received for the public lamps, owing to the curtailment of the number of lighting hours. The report (which was signed by the Secretary, Mr. Denny Lane) stated that the balance of the profit and loss account was £4924; and a dividend at the usual rate of 8 per cent. was recommended. To pay this £776 had been taken from the reserve, which was thereby reduced to £11,361.

BARNET DISTRICT GAS AND WATER COMPANY.

The Half-Yearly General Meeting of this Company was held last Friday, at the Guildhall Tavern, Gresham Street, E.C.—Mr. J. GLAISHER, F.R.S., in the chair.

The SECRETARY (Mr. Alfred Lass, F.C.A.) read the notice convening the meeting; and it was agreed to take as read the Directors' report and the statement of accounts for the half year ending Dec. 31 last, a reference to which appeared in the JOURNAL last week (p. 354).

The CHAIRMAN remarked that he had not much to say on this occasion. The sentence in the report which stated that the sinking of the new well and the erection of the new engine, pumping machinery, and engine-house were completed, that the work had been carried out satisfactorily, and that the yield of water had fully realized the anticipations of the Directors, was the most important one that had ever appeared in any report since he had been connected with the Company. To show the import of this statement, he had to go back and take a retrospect. When the Act of Amalgamation was obtained in 1872, the only well they had was that which had been sunk by the British Land Company. It was a small well, only 4 ft. 6 in. in diameter, and only sunk to 140 feet; being between 20 and 30 feet short of the chalk. The engine power was also small; and therefore, as soon as possible after amalgamation, they attempted to get water at Finchley, and spent £14,000 without any beneficial result; so that in 1875 the Board were still struggling with the old well and with the weak machinery. In January, 1876, they began to sink a second well about 40 feet distant from the other well; and by November, 1877, they had carried it down to 175 ft. 6 in. In April, 1881, it was deepened to 195 ft. 6 in.; and they were well into the chalk to the depth of 22 ft. 6 in. The diameter of this well was 9 feet; and they had a bore-hole 270 feet below the bottom of it. This enabled them in 1879 and 1880 to begin to enlarge and deepen the original well. They enlarged it from 4 ft. 6 in. to 8 feet in diameter, gradually getting out to 9 ft. 6 in. at the bottom. They deepened it in 1879-80 to the same depth as the other one—195 ft. 6 in.; and then in 1886-7 it was still further deepened to 238 ft. 6 in., being 65½ feet in the chalk. They were then beginning to feel strong in regard to the supply of water; but still the consumption continued to increase, and they had to grapple with that, so in 1885, they commenced sinking the last well which the Directors said, in their present report, was now completed. The diameter of this well, he said, was 9 feet throughout, and was carried to a depth of 257 feet; being 84 feet in the chalk, and below this they had a bore-hole 96 feet. All the three wells were connected one with the other by adits. To his and the Board's satisfaction, the water was very abundant; and they had water at command for a good many years. He did not think that the demand for water would increase more rapidly in the future than it had done in the past. They had sufficient engine power to distribute this water easily; and they had a duplicate engine in case of breakdowns. Therefore, he might say, they stood in a prouder position that day in regard to the water supply than they had ever been since he had been on the Board; and they should not have to spend any money in this respect for a very considerable time. In 1880, the water revenue was £6000; and last year, it was £12,000. In 1883, they had 3515 consumers; last year, 5488. In 1883, they had 48 consumers per mile of main; and last year nearly 62. In 1883, the water revenue was £9000; and in 1888, £12,000. Turning to the gas department of the Company's business, there was, he said, a little increase in the make of gas in the past six months as compared with the corresponding half of the previous year. They had last year 289 public lamps; whilst in the preceding year they had 100 more. Consequently, the quantity of gas they had made had not been in the usual increase of 5 per cent.; it would have been if the public lamps had been in operation. It did not affect the profit much; for the profit upon public lighting was small. It was, however, greatly to the interest of the Company that the lighting of the streets should be good; because where the public lighting and the water supply were good, people would continue to reside. It would be remembered that when he last addressed the shareholders, he was in hope that the reduction in the price of gas would give them a fillip; and he still believed it would. Taking the whole of last year, they carbonized 5500 tons of coal, being about 200 tons more than in the previous year. The great desire of the Board was to bring the price down as fast as possible. In 1880, it was 6s. per 1000 cubic feet; in 1883, it was reduced to 5s.; it was now 4s. He could not help thinking that there were a great number of persons in the Barnet district who were deterred from using gas when it was 6s. who would now use it; seeing how convenient it was not only for lighting but for cooking and heating purposes. The increase on the gas was not so satisfactory as on the water. Between 1879 and December, 1888, there were only 508 new services put in; whilst for water there were 4095—eight times as many new services for water as for gas. He hoped, however, that that would be better in the future. There was nothing he had to report that day but what was satisfactory; and, under the circumstances, he had much pleasure in moving—"That the report of the Directors and the balance-sheet be received and adopted and entered on the minutes."

Mr. C. HOBSLEY, J.P., seconded the motion.

Mr. WAKEFIELD said he did not wish to find any fault; but the Chairman's statement was almost the same as they had heard over and over again—that the gas had not increased so much as the Board would have liked; but that the water had increased very much indeed. They could not blink their eyes to the fact that they had a very large capital considering the return they had. In all neighbouring companies that he was aware of they were paying at least 10 per cent.; while on their own old shares they only had 7 per cent. He expressed surprise at the gas not having increased, and could not see why it had not done so as well as the water.

The CHAIRMAN said that the capital employed per ton of coal carbonized was £15; while in the case of some of the companies to which Mr. Wakefield referred as paying higher dividends it was less than £5. It was £21 a few years ago. The Board saw the black spot in their affairs; and they saw it still. When he stated that last year they raised and sold 231,730,000 gallons of water, and the capital employed was £121,272—that was, £522 for every million gallons, and the average of the London Companies was £240—the honourable proprietor would see that the Board had great difficulties to contend with.

Mr. LONDON said he thought the unaccounted-for gas—3,317,000 cubic feet—was very high.

The CHAIRMAN said the question of the unaccounted-for gas had been very recently before the Board. The Works Committee were going to try and find out how it could be reduced; and the Engineer (Mr. T. H. Martin) was very watchful.

Mr. HOBSLEY observed that the Company had 40 miles of mains; and there were only 1200 consumers. The Barnet Local Board having taken away a portion of the public lighting and adopted the electric light, this made a little difference. Referring to the remarks of Mr. Wakefield, he said that it must be borne in mind that they could pay a little more dividend now; and they had done a great deal out of revenue. Their

Committee of Investigation; but, of course, it must be on certain terms. He had drawn up something which he hoped would be approved, and which was as follows:—"The Board will be very pleased to agree to an investigation as suggested by the circular issued by the Provisional Committee; but they decline to submit the matters to be dealt with to any Committee or person connected in any way with the Gas Company, except inso far as may be necessary for the pur poses of giving evidence. They propose a Referee (who shall be a Counsel) to be mutually agreed upon by the Board and the Provisional Committee; but, before this step takes place, the terms of the reference to him must be defined, and agreed between the Provisional Committee and the Board." It was necessary, he continued, to have an absolutely independent Referee; and if matters extending over a long series of years were gone into, the expense would be enormous, and no beneficial results would be obtained.

Mr. RICHARDSON said he had prepared the following resolution, which he proposed:—"That a Committee be appointed, who shall be empowered to hold an official inquiry into the administration of the Company, and into the differences which have unhappily divided the Board; and that the said Committee be authorized to take the evidence of any Director, officer, or servant of the Company, and to have access to all books and documents in the possession of the Company at the discretion of the said Committee; that the Directors be requested to place their resignation in the hands of the Committee pending their investigation; and that the said Committee be requested to report their conclusions, at as early a date as may be conveniently possible, to a general meeting of the Company to be specially convened for that purpose."

Mr. EXLEY seconded the resolution.

The resolution, on being put to the meeting, was rejected.

The CHAIRMAN said the Directors were anxious that there should be an investigation; and if the members of the Provisional Committee would confer with the Directors, they would be very pleased to try and meet their views. Continuing, he proposed—"That, in accordance with formal notice convening this meeting, dated the 4th of February, it is hereby resolved that Mr. Richard William Giles, one of the present Directors, be and hereby is removed from his office as a Director of the Company, and that the number of the Directors of the Company for the future be reduced from nine to eight."

Dr. HIGHETT seconded the resolution.

Mr. GILES asked for some specific information as to the reasons why he was to be expelled from the Board—a course which inflicted a shameful stigma on his name.

The CHAIRMAN said the Board asked Mr. Giles to resign, and he declined. In their opinion, he had throughout shown a want of loyalty to his colleagues. He had shown a perfect independence of action; and he had declined practically to work in harmony with his colleagues in any way. The question for the meeting was whether they would practically lose the whole of the present Board, or whether they would accept the management of Mr. Giles.

Mr. GILES having replied,

A division was thereupon taken, when 38 votes were recorded for the resolution, and 39 against it.

The CHAIRMAN said he should, of course, put in the proxies.

Mr. GILES protested against the use of the proxies, on the ground that they were given without knowledge of the fact that it was intended to expel him.

The CHAIRMAN then declared the resolution carried.

A dividend at the rate of 10 per cent. per annum was agreed to, and a vote of thanks to the Chairman closed the meeting, which occupied four hours and a quarter.

CROYDON COMMERCIAL GAS COMPANY.

The Half-Yearly General Meeting of this Company was held last Wednesday, at the Offices, Katharine Street, Croydon—Mr. CHARLES NEWTON in the chair.

The SECRETARY (Mr. W. J. Russell) read the notice convening the meeting; and the Directors' report and accounts for the half year ending Dec. 31, which were summarized in the JOURNAL last week (p. 352), were taken as read.

The CHAIRMAN moved—"That the report of the Directors and the accounts for the half year ending the 31st of December, 1888, showing a balance of £18,086 17s. 3d. available for dividend, be received and adopted." He said that he should except from the report the paragraph relating to the number and remuneration of the Directors, as it was a matter of some importance, and should receive special consideration. He proposed, therefore, that this paragraph should not be embodied in the resolution now before them, but that it should be brought forward at a later stage of the proceedings. The report that he had to submit to the shareholders was one, he thought, that they would join with the Directors in thinking exceedingly satisfactory. The progress of the Company had been such as to show an increase in the quantity of gas consumed of something like 8 million cubic feet; and, notwithstanding the loss in the revenue of nearly £500 consequent upon the previous reduction in price, the Board had, owing to this increase in the sale of gas and the better revenue derived from residuals, felt themselves in a position to do two things which he shadowed forth at the last meeting—one was an announcement of a further reduction in the price of gas; and the other was an increase in the dividend. It was proposed to reduce the price of gas at the end of the current quarter to 2s. 11d. per 1000 cubic feet; and although they were not in a position to say that they would in the course of time be able to again reduce it, he had strong hopes that they would see their way clear to go on lowering the price as the sale of gas increased. It would be seen that, notwithstanding the payment of an increase of 1 per cent. in the dividend and all the charges incident to it, they were able to carry forward a balance of about £600 to the undivided profits beyond that brought forward at the commencement of the half year. As the loss upon this half year through the reduction in the price of gas would only amount to £250, in the summer quarter they would be in a position to meet that, and carry over £350 more than was brought forward. The items in the accounts did not require any remarks from him on the present occasion; and he would rather avail himself of the opportunity of taking a review of the past. He thought he should be able to show that the progress of the Company had been satisfactory. He had made some calculations in regard to the years from 1873 to 1878, and from 1883 to 1888; but as the figures for the first-named five years were almost similar to those for the years 1883 to 1888, he should restrict himself to the latter. The points that he had taken for comparison were (1) as to the capital raised; (2) the quantity of gas sold; (3) the price charged for gas; (4) the amount of profit made; and (5) the rates of dividend paid. In 1883 the capital of the Company was, in round numbers, £212,000; in 1888, £213,600—a difference of only £1600. The usual and simplest mode of calculating whether the capital of a Company was moderate or excessive was to ascertain the proportion of capital employed to the ton of coal carbonized. For each ton of coal carbonized in 1883, the capital required was £8 1s. 1d.; in 1888, £5 15s. 10d.—or a decrease in the five years of £2 5s. 3d. The effect of this was: That, whereas in 1883 they had to take out of the profits a sufficient sum to pay a dividend upon £8 1s. 1d. for every ton of coal carbonized, in 1888 they had only to take sufficient to pay a dividend upon £5 15s. 10d. When the quantity of coal the Company now used was considered (nearly 19,000 tons in the half year), the shareholders could judge how much less profit was required to pay the dividend in proportion to the capital; and all this went to benefit the consumers. The next point was as to the quantity of gas sold. In 1883, the amount was 271,600,000 cubic feet; in 1888, 369,700,000 feet—an increase of 98,100,000 feet in five years; or equal to an average of 7 per cent. per annum. He believed in most provincial companies 5 per cent. was reckoned a very high increase per annum; but he was glad to say their Company showed a growth per year of 7 per cent. In regard to the price paid for gas, in 1883, it was 3s. 6d.; in 1888, 3s. It was rather singular that in 1872 the price was 4s. 6d.; in 1878, it was reduced to 4s.; in the next five years to 1883, it was reduced to 3s. 6d.; and in the following five years, to 3s. It would be noticed that there had been a gradual reduction of 6d. every five years. Whether the Company would be able to continue making reductions at this rate every five years, he was unable to say. In 1883, the profit was £18,273; in 1888, £21,385—an increase of £3112, notwithstanding the reduction which had taken place of 6d. per 1000 feet, and which was equal to a saving to the consumers of something like £16,000 a year. In regard to the rates of dividend, in 1883 they had 12 and 9 per cent.; and in 1888, 14 and 11 per cent. These results indicated the satisfactory progress which the Company had made. It was just possible that some shareholder might say: "You tell us so much as to the past, what about the future?" Well, he was not a prophet; and therefore he could not predict what the next five years would bring forth. However, from what he at present knew in regard to the extended use of gas in Croydon for heating and motive power, and with the determination of the Directors to keep the capital from increasing as much as they could—to bring it down, in fact, to £5 per ton of coal carbonized—he had every reason to think that the Board in 1893 would be in a position to submit to the shareholders as satisfactory a statement of accounts as the Directors had to do on the present occasion; and he believed the then Chairman would be able to repeat what he thought he might now truthfully say, that the shareholders were the possessors—and he believed it was generally acknowledged to be so—of one of the most prosperous and flourishing provincial gas undertakings in the kingdom.

Mr. W. HYSLOP seconded the motion.

Mr. PELTON observed that nothing was said in the report, nor had been mentioned in the Chairman's speech, respecting the saving that would result from the abolition of the coal and wine dues; and he should like a little information on the point. He went on to congratulate the Chairman on the statement of affairs that he had been able to place before the shareholders; but there was one matter which he should like explained. It was this: That every one of the Gas Companies round about them, without exception, charged a considerably less price than they did, and yet kept up their dividends, paid the Directors, and maintained their concerns in a prosperous condition. The South Metropolitan Gas Company were charging 2s. 5d.; the Crystal Palace Company were considerably below Croydon; and at Bromley the price was 2s. 6d. These Companies promised a reduction on the cessation of the coal dues. The Chairman had stated that in 1883 the capital per ton of coal carbonized was about £8; and in 1888, £5. In that period the price of gas had been reduced from 3s. 6d to 3s. Comparing these figures, the capital employed per ton of coal had been lowered from 8 to 5; whereas the price of gas had only gone down from 7 to 6. There was a large margin here; and he should like an explanation of the discrepancy.

Mr. HALE called attention to the fact that in the accounts for the preceding half year the cash at the bankers was £8950; while in the present statement it was only £1964. In the previous accounts the debtors to the Company were given as £9700; and this half year he found they were as much as £19,200.

The CHAIRMAN, in reply, said, with reference to the coal and wine dues, that if all the circumstances remained exactly the same when they were taken off as at the present time, the Company would have the benefit perhaps of 1s. per ton of coal; but the reduction in the price of coal to the general public would have an effect upon the price they would realize for coke, and upon coke they depended at the present time for a large portion of their profits. He believed coal was now 1s. per ton dearer at the pit's mouth; and there was every probability that it would not come down again to the price of a year or two ago. Therefore he did not think they would be able to take the whole of the advantage of the 1s. per ton, because he was afraid that the counteracting disadvantages would operate against it. With regard to the price of gas, companies differently circumstanced could not be fairly compared. For instance, the South Metropolitan Company, he supposed, for every mile of main they possessed, would take about £1000; whereas in Croydon they took something like £100. They were also enabled to get coal at a much cheaper rate; and as they dealt in millions, it must be obvious to any person that the proportion of expenses was a great deal more in a small company than in a large one. In reference to the prices round about them, at Bromley 3s. 6d. was charged (not 2s. 6d. as stated by Mr. Pelton); and it was, he believed, to be reduced to 3s. At Sutton the price was 4s., subject to 6d. discount; and at Carshalton it was 4s. 6d. It was just as unfair to say how cheap the gas was in comparison with Sutton or Carshalton, as to compare it with the South Metropolitan or Crystal Palace Companies. He was afraid that Mr. Pelton misunderstood the statement as to the capital used per ton of coal carbonized. He (the Chairman) said that whereas in 1883, they had to take out of profits such a sum as would pay a dividend upon £8, in 1888 they had to pay a dividend on only £5 15s. The dividend upon the £8 1s. 1d. was equal to 1s. 7¼d. per 1000 cubic feet of gas sold; and upon £5 15s. 10d., to 1s. 1¾d. He was perfectly sure that there was no company in England, similarly circumstanced to their Company, that sold gas at less price than they did. In reply to Mr. Hale, he said that the figures in the accounts should be compared with the corresponding half year, and then he would see that there was very little difference.

The motion was unanimously carried.

On the proposal of the CHAIRMAN, dividends were declared for the half year at the rate of 10 per cent. per annum on the capital of £51,600, and of 7 per cent. per annum on the capital of £137,000, and an additional dividend, under the sliding scale, at the rate of 4 per cent. per annum, all less income-tax.

The CHAIRMAN then alluded to the resolution passed at the February meeting last year, to the effect that the question of the remuneration of the Directors and their number should be referred to the Board for them to consider, and to report to the present meeting of shareholders. He said, as would be seen by the report, the Board recommended that, as vacancies occurred, their number should be reduced to six, and that from the 1st ult. each Director should be paid a fixed sum of £200 per annum. These matters would be taken under separate resolutions; and he would first propose—"That, as vacancies occur by death or resignation, the number of Directors be reduced to not less than six."

Mr. PELTON seconded the motion.

Some discussion ensued, in the course of which certain of the speakers

expressed the opinion that, as the Company had been prosperously conducted by a Board of eight gentlemen, that number should be retained.

The CHAIRMAN pointed out that the Directors were only requested to report on the matter at the present meeting; and their Solicitor (Mr. E. K. Blyth) advised him that, unless the vote was unanimous on the present occasion, the resolution would not be valid. As there was some divergence of opinion in the room, he did not think the matter should be proceeded with; and he would give notice that he would bring the resolutions forward at the next meeting.

The retiring Directors (Messrs. H. Chasemore, A. J. Lambert, and J. S. Wright) and Auditor (Mr. A. Twentyman) were re-elected.

On the motion of Mr. HYDE, seconded by Mr. MARSHALL, a vote of thanks was accorded to the Directors and officers of the Company for the zealous way in which they attended to the Company's affairs.

The CHAIRMAN, in responding to the compliment, suitably acknowledged the loyal manner in which the Board were supported by the officers.

The proceedings then terminated.

IPSWICH GASLIGHT COMPANY.

The Half-Yearly Meeting of this Company was held yesterday week—Mr. S. WESTHORP in the chair.

The CHAIRMAN moved the adoption of the report and accounts, an epitome of which was given in the JOURNAL last week (p. 349). In doing so, he said he thought the shareholders might congratulate themselves upon the general tenor of the report, not only as regarded the present position of the Company, but also in respect to its future prospects. It had been hinted that the Directors had been frightened into reducing the price of gas by the present or coming competition. He assured them it was no such thing; they had done it on the common principles of commerce. They had provided the public with a cheaper article; and they had thus obtained for the shareholders a larger dividend. They commenced reducing the price of gas in October, 1886; and the fact that in three-and-a-half years they had lowered it from 3s. 6d. to 2s. 10d. per 1000 cubic feet, and at the same time had increased their dividends, was, he thought, very satisfactory. As to the Company's new sulphate-house, it had already been productive of an increase in the receipts amounting to £408; and they hoped for still further profits from this source in time to come. By relaying some of the mains, they had decreased the leakage very considerably. It was now 6·57 per cent., which, taking the average leakage of other companies, was very low. Referring to the question of the lighting of the public streets, the Chairman contended that it was impossible to light the town with burners passing only 3½ cubic feet of gas per hour. The Company had decreased the price of gas, and the Corporation had largely increased the consumption; but, as a matter of fact, they were not paying as much now as they did when the consumption was less. He hoped the Council would adopt the suggestion of which notice had been given by one of the members, and order the whole of the lamps in the town to be supplied with 5-feet burners. With regard to the residuals, he was thankful to say they had tided over a period of depression, and he thought they might hope for an improved trade in this department in the future.

Mr. BIDDELL seconded the motion.

Mr. JEFFRIES congratulated the shareholders on the marked improvement in their property. He said he was glad to find that the agitation he had kept up so long in favour of cheaper and better gas had not been altogether futile. Some of the suggestions he made years ago were characterized as ridiculous; but nearly the whole of these suggestions had since been adopted by the Directors. He should not, however, be satisfied until the Company supplied 16-candle gas at 2s. 6d. per 1000 cubic feet, which he was thoroughly satisfied they could do. He did not blame the Gas Company for the insufficient light in the public streets. The gas was good enough; but the authorities were endeavouring to light three miles of streets with a quantity of gas which was only sufficient to light two miles. Concerning the proposed addition to the remuneration of the Directors, he did not think, in the face of the opposition from the electric light, that this was the proper time to ask for an increase.

The CHAIRMAN said that Mr. Jeffries talked a great deal about 16-candle gas; but he should like to state that the average of the gas supplied during the past year had been 15·90 candles, so that they were getting very near to Mr. Jeffries' standard. He could not call to mind any suggestion of Mr. Jeffries which had induced the Directors to adopt the policy they were now pursuing.

Mr. FRASER considered that the report was extremely satisfactory; but with regard to the proposed increase in the remuneration of the Directors, he agreed with Mr. Jeffries that that this was an inopportune moment to bring the matter forward.

The motion was agreed to.

On the motion of the CHAIRMAN, seconded by Mr. BIDDELL, it was resolved—"That a dividend of 12s. per share upon shares class 'A,' 9s. 6d. per share upon class 'B,' and 9s. per share upon shares class 'C,' be paid on and after March 1 next; making, with the interim dividend paid in September last, a dividend of 11 per cent. per annum upon shares class 'A,' 8¾ per cent. per annum upon shares class 'B,' and 8 per cent. per annum upon shares class 'C.'"

The retiring Directors having been re-elected,

Mr. MILLER proposed that the remuneration of the Directors be increased to £400 a year. He remarked that he was sure the proposal would meet with the approval of the shareholders, even though there were a few dissentients there. It was now thirteen years since any alteration was made in the remuneration of the Directors; and since that time the capital of the Company had grown from £76,000 to £115,000, and the coal consumed had increased from 11,000 or 12,000 tons to between 16,000 and 17,000 tons. The great prosperity which had attended the Company was due to the efficient way in which the business had been managed by the Directors; and he maintained that the remuneration they had hitherto received was quite inadequate.

Mr. READ seconded the proposal.

Mr. FRASER proposed, as an amendment, that the question be deferred until the next meeting.

Mr. JEFFRIES seconded the amendment.

On being put to the vote, the amendment was lost, and the original resolution was agreed to.

Votes of thanks to the Directors and to the officers terminated the proceedings.

CORK GAS CONSUMERS' COMPANY.—The half-yearly meeting of this Company was held yesterday, when the Directors reported a slight increase in the private consumption, but a falling off in the amount received for the public lamps, owing to the curtailment of the number of lighting hours. The report (which was signed by the Secretary, Mr. Denny Lane) stated that the balance of the profit and loss account was £4924; and a dividend at the usual rate of 8 per cent. was recommended. To pay this £776 had been taken from the reserve, which was thereby reduced to £11,361.

BARNET DISTRICT GAS AND WATER COMPANY.

The Half-Yearly General Meeting of this Company was held last Friday, at the Guildhall Tavern, Gresham Street, E.C.—Mr. J. GLAISHER, F.R.S., in the chair.

The SECRETARY (Mr. Alfred Lass, F.C.A.) read the notice convening the meeting; and it was agreed to take as read the Directors' report and the statement of accounts for the half year ending Dec. 31 last, a reference to which appeared in the JOURNAL last week (p. 354).

The CHAIRMAN remarked that he had not much to say on this occasion. The sentence in the report which stated that the sinking of the new well and the erection of the new engine, pumping machinery, and engine-house were completed, that the work had been carried out satisfactorily, and that the yield of water had fully realized the anticipations of the Directors, was the most important one that had ever appeared in any report since he had been connected with the Company. To show the import of this statement, he had to go back and take a retrospect. When the Act of Amalgamation was obtained in 1872, the only well they had was that which had been sunk by the British Land Company. It was a small well, only 4 ft. 6 in. in diameter, and only sunk to 140 feet; being between 20 and 30 feet short of the chalk. The engine power was also small; and therefore, as soon as possible after amalgamation, they attempted to get water at Finchley, and spent £14,000 without any beneficial result; so that in 1875 the Board were still struggling with the old well and with the weak machinery. In January, 1876, they began to sink a second well about 40 feet distant from the other well; and by November, 1877, they had carried it down to 175 ft. 6 in. In April, 1881, it was deepened to 195 ft. 6 in.; and they were well into the chalk to the depth of 22 ft. 6 in. The diameter of this well was 9 feet; and they had a bore-hole 270 feet below the bottom of it. This enabled them in 1879 and 1880 to begin to enlarge and deepen the original well. They enlarged it from 4 ft. 6 in. to 8 feet in diameter, gradually getting out to 9 ft. 6 in. at the bottom. They deepened it in 1879-80 to the same depth as the other one—195 ft. 6 in.; and then in 1886-7 it was still further deepened to 238 ft. 6 in., being 65½ feet in the chalk. They were then beginning to feel strong in regard to the supply of water; but still the consumption continued to increase, and they had to grapple with that, so in 1885, they commenced sinking the last well which the Directors said, in their present report, was now completed. The diameter of this well, he said, was 9 feet throughout, and was carried to a depth of 257 feet; being 84 feet in the chalk, and below this they had a bore-hole 36 feet. All the three wells were connected one with the other by adits. To his and the Board's satisfaction, the water was very abundant; and they had water at command for a good many years. He did not think that the demand for water would increase more rapidly in the future than it had done in the past. They had sufficient engine power to distribute this water easily; and they had a duplicate engine in case of breakdowns. Therefore, he might say, they stood in a prouder position that day in regard to the water supply than they had ever been since he had been on the Board; and they should not have to spend any money in this respect for a very considerable time. In 1880, the water revenue was £6000; and last year, it was £12,000. In 1883, they had 3515 consumers; last year, 5488. In 1883, they had 48 consumers per mile of main; and last year nearly 62. In 1883, the water revenue was £9000; and in 1888, £12,000. Turning to the gas department of the Company's business, there was, he said, a little increase in the make of gas in the past six months as compared with the corresponding half of the previous year. They had last year 289 public lamps; whilst in the preceding year they had 100 more. Consequently, the quantity of gas they had made had not been in the usual increase of 5 per cent.; it would have been if the public lamps had been in operation. It did not affect the profit much; for the profit upon public lighting was small. It was, however, greatly to the interest of the Company that the lighting of the streets should be good; because where the public lighting and the water supply were good, people would continue to reside. It would be remembered that when he last addressed the shareholders, he was in hope that the reduction in the price of gas would give them a fillip; and he still believed it would. Taking the whole of last year, they carbonized 5500 tons of coal, being about 200 tons more than in the previous year. The great desire of the Board was to bring the price down as fast as possible. In 1880, it was 6s. per 1000 cubic feet; in 1883, it was reduced to 5s.; it was now 4s. He could not help thinking that there were a great number of persons in the Barnet district who were deterred from using gas when it was 6s. who would now use it; seeing how convenient it was not only for lighting but for cooking and heating purposes. The increase on the gas was not so satisfactory as on the water. Between 1879 and December, 1888, there were only 508 new services put in; whilst for water there were 4095—eight times as many new services for water as for gas. He hoped, however, that that would be better in the future. There was nothing he had to report that day but what was satisfactory; and, under the circumstances, he had much pleasure in moving—"That the report of the Directors and the balance-sheet be received and adopted and entered on the minutes."

Mr. C. HORSLEY, J.P., seconded the motion.

Mr. WAKEFIELD said he did not wish to find any fault; but the Chairman's statement was almost the same as they had heard over and over again—that the gas had not increased so much as the Board would have liked; but that the water had increased very much indeed. They could not blink their eyes to the fact that they had a very large capital considering the return they had. In all neighbouring companies that he was aware of they were paying at least 10 per cent.; while on their own old shares they only had 7 per cent. He expressed surprise at the gas not having increased, and could not see why it had not done so as well as the water.

The CHAIRMAN said that the capital employed per ton of coal carbonized was £15; while in the case of some of the companies to which Mr. Wakefield referred as paying higher dividends it was less than £5. It was £21 a few years ago. The Board saw the black spot in their affairs; and they saw it still. When he stated that last year they raised and sold 231,730,000 gallons of water, and the capital employed was £121,272—that was, £522 for every million gallons, and the average of the London Companies was £240—the honourable proprietor would see that the Board had great difficulties to contend with.

Mr. LONDON said he thought the unaccounted-for gas—3,317,000 cubic feet—was very high.

The CHAIRMAN said the question of the unaccounted-for gas had been very recently before the Board. The Works Committee were going to try and find out how it could be reduced; and the Engineer (Mr. T. H. Martin) was very watchful.

Mr. HORSLEY observed that the Company had 40 miles of mains; and there were only 1200 consumers. The Barnet Local Board having taken away a portion of the public lighting and adopted the electric light, this made a little difference. Referring to the remarks of Mr. Wakefield, he said that it must be borne in mind that they could pay a little more dividend now; and they had done a great deal out of revenue. Their

Secretary was for reducing the capital as far as possible, and making it more uniform with the London Companies. But he (Mr. Horsley) knew they should never get it down so low until some of the district was filled up.

Mr. I. A. Crookenden said he thought Mr. Wakefield had taken rather a gloomy view of the situation. He did not consider, upon reflection, that there was any cause or justification for so despondent a position being assumed. He thought, having regard to the Company being strictly suburban, and looking at it from a technical point of view, things were satisfactory all round. It was clear to his mind that the question here was one of capital—the capital employed having regard to the income of the Company. This, of course, governed the dividend entirely. He thought with the Chairman that this was a very hopeful period in the Company's history.

The motion was then carried.

On the proposition of the Chairman, seconded by Mr. Horsley, dividends were declared for the half year ending December 31 last at the rate of 7 per cent. per annum on the "A" and "C" stocks, 6 per cent. per annum on the "B" stock, and £4 18s. per cent. per annum on the "D" (water) capital.

The retiring Directors (Messrs. H. T. Balfour and A. H. Baynes) and Auditor (Mr. A. G. Hounsham) were next re-elected.

A vote of thanks was then passed to the officers of the Company.

The Engineer (Mr. T. H. Martin, Assoc. M. Inst. C.E.), in acknowledging the vote, mentioned that in supplying the parish of Finchley with water, they took in the whole of Friern Barnet; but in both of those parishes they had a very small portion of the gas supply. The North Middlesex and Colney Hatch Gas Companies occupied nearly the whole of those parishes.

A vote of thanks to the Chairman and Directors terminated the proceedings.

CAGLIARI GAS AND WATER COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Tuesday at the London Offices, 3, Lothbury, E.C.—Mr. John Aird, M.P., in the chair.

The Secretary (Mr. Rod. Mackay) read the notice convening the meeting; and the Directors' report and accounts (referred to in the Journal last week, p. 346) were taken as read.

The Chairman said it was his duty—as also to him personally a great pleasure—to move the adoption of the Directors' report and accounts for the year ending Dec. 31 last. He should not require to keep the shareholders at any great length in the discussion of a report which, the Directors felt, would commend itself to the approval of the general body of proprietors. The progress of the Company during the twelve months had been steady; and there was a small increase in the supply of both water and gas. The unaccounted-for gas was much less in the past year than in the preceding one; and the Directors thought the general financial position and the prosperity of the concern had been maintained. It was proposed to declare that day not only the usual dividend for the half year at the rate of 8 per cent. per annum, but the Board were glad to be able to again pay to the shareholders the bonus which was given on one previous occasion. They were also enabled to make not only the usual addition to the sinking and reserve funds, but a further sum of £1000 had been added to the special reserve fund, which the shareholders agreed should be created a year since. In reference to the accounts, there was another satisfactory feature. The proprietors would note that the rates and taxes in Cagliari amounted to £1399; and so while the prosperity of the Company continued, they were giving yearly a very substantial sum to the Cagliari authorities for dealing with municipal and other matters. The loss on exchange for remittances in the year was £512; and though the Board regretted that this amount should be paid away, they could not but feel satisfaction when it was remembered that five or six years ago, the sum charged to the yearly revenue was about three and (on one occasion) four times that figure. It was satisfactory as showing the greatly improved financial condition of Italy; and, seeing that the welfare of the Company was naturally very much associated with that of the country, as the financial strength of Italy increased, so must the position of their undertaking. The Board were glad to know that during the year friendly relations with the authorities had continued; and it was a source of great satisfaction to the Directors on a recent occasion when unfortunately the banks in Cagliari failed, to be able, without any detriment to the Company, to facilitate the financial arrangements of the authorities. Both in regard to the supply of gas and water, the Directors were in a position to say—and this was confirmed by the report of their Manager—that in all respects the Company had fulfilled its duty to the authorities—for the water had been all that could be desired, and they had had no complaints of any sort; and as regards the gas supply, that had likewise given entire satisfaction. They had endeavoured in every way to meet the wishes of the authorities; while they had sought, by well-managing the concern, to bring the largest amount of profit to those whose interests it was the desire of the Board to serve. There was one other matter to which he thought he ought to refer as affecting the sinking and insurance funds, which, as would be seen by the accounts, had been invested to a very large extent in the shares of the Company. A doubt was raised some short time ago as to whether it was legally right to do this; and the Board thought it wise, in the interests of the shareholders and also of the Trustees, that a legal opinion should be taken on the subject. They were advised that it was not legal for a Company to invest the reserve funds in their own shares; and therefore they proposed shortly, acting upon this advice, to re-transfer this amount, and put it in some other security which would command the confidence of the Directors. He ought to say there would be no loss; on the contrary, considerable gain would arise to these funds from the mistake that they had made in the past—inasmuch as the shares were bought in, in the interest of these funds, at a very low price; and, as many of the shareholders knew, they now sold at a very large premium. Therefore, all this advantage would go to the special funds which they desired to see grow as time went on. There was no other point to which he thought it necessary to refer, except, in conclusion, to say that his colleagues and himself were all agreed that the prosperity of the Company was maintained; and that it was as sound now as they had always believed it to be. They hoped, with the continued care the Board would give to the business, that the success of the concern would in the future be equally assured.

Mr. Joseph Quick seconded the motion.

Mr. Payne asked what was the object of the special reserve fund, and why it was proposed to add to it?

The Chairman replied that the special reserve fund was created last year. The Board made very careful calculations (being guided by Mr. Mackay), and an annual amount had been put by which would, at the time the concession ran out, return the whole of the capital to the shareholders. But last year they were financially very strong; and the suggestion was made that it would be well and wise (although the calculations of the Board were sound and right) to create a special reserve fund—to get a certain amount of money to back up that guarantee. Therefore the Directors recommended to the shareholders last year that they should put by £1000 to such a fund; and the financial position of the Company being again strong, they thought it was a further opportunity of increasing the amount.

Mr. Galbraith inquired what the proposals of the Board were in regard to the issue of the shares standing in the name of the sinking and reserve funds.

The Chairman said the matter was under the consideration of the Board at their last meeting; but he was not quite in a position at the moment to say what they would recommend to the shareholders in this respect. The shares would have to be sold; and, unless some arrangement was made which was greatly to the benefit of the proprietors, it would certainly be their duty to offer them to the shareholders at large. There were about 400 shares; and the market value was between £9000 and £10,000.

Mr. Tooth asked if they would be offered *pro ratâ*.

The Chairman answered that, having regard to the small quantity, he thought it probable that a circular would be issued to the shareholders, asking them to send in applications if they required any. In reply to a further question, he said he believed that the shares would be sold with the premium attached. He was not at liberty to explain more fully, because the Board had not entered into communication with other parties. There was an idea suggested that, in the interests of the Company, they might deal with the shares *en bloc*. Mr. Phillips thought he (the Chairman) should say that if the shares were allotted to the shareholders, they would have the opportunity of taking them at their market value.

The motion was then unanimously agreed to.

Mr. Tooth observed that on the last occasion, there was a suggestion made to raise the fees of the Directors—he believed from £250 to £500. He had much pleasure in moving that this proposal be acceded to.

Mr. Robert King seconded the motion; and it was carried.

The Chairman suitably acknowledged, in a few words, the very tangible form in which the shareholders had shown their appreciation of the services of the Board.

The Chairman moved that the interim payment on account of dividend on Aug. 13 last, and a dividend for the past half year at the rate of 8 per cent. per annum, with a bonus of 5s. per share (less income-tax) be agreed to.

Mr. F. Wigan seconded the motion, which was unanimously carried.

On the motion of Mr. J. Orwell Phillips, seconded by Mr. Barrow, the Directors retiring by rotation (Messrs. J. Aird and F. W. Blunt) were re-elected; as were also the Auditors (Messrs. H. Bishop and E. O. Coe), on the motion of Mr. Tooth, seconded by Mr. King.

The usual complimentary vote having been passed to the Chairman and Directors, the proceedings terminated.

PROVINCIAL GAS AND WATER COMPANIES.

Following the plan adopted in the last and the preceding issue of the Journal, we give below the chief points in the working of the undermentioned Companies for the periods stated:—

The Directors of the Brighton and Hove Gas Company report an increase in the amount received from the sale of gas, as well as in the value of the residual products, for the six months ending Dec. 31 last, as compared with the corresponding period of 1887. The receipts for gas amounted to £62,059; those for residuals to £10,333—the total receipts being £73,518. The expenditure amounting to £50,483, there was a balance of £23,035 to go to the profit and loss account. The sum available for dividends is £35,365. The dividends to be recommended at the meeting on the 8th prox. are at the rates of 10½, 7½, and 6 per cent. per annum on the various classes of stock.

The half-yearly general meeting of the Chesterfield Water and Gas Company was held last Friday—Mr. R. T. Gratton in the chair. The statement of accounts showed that the receipts from the sale of water, after deducting allowances and bad debts, were £3343; and from gas £4666. Coke and other residuals realized £784. The total income was £8745. The manufacture and distribution of gas cost £1800; the distribution of water, £251. The balance carried to the net revenue account was £4540; and there was a sum of £4378 available for division. The Directors recommended a dividend at the rate of 5 per cent. per annum on the whole of the capital. The report was adopted; and the dividend recommended was declared.

At the half-yearly meeting of the Kendal Gas and Water Company held last Tuesday, the Directors reported that the total consumption of gas in the six months ending Dec. 31, 1888, amounted to 20,147,500 cubic feet; being an increase of 762,100 cubic feet over the corresponding half of 1887. The water-rental for the same period amounted to £1360 15s. 6d.; being an augmentation of £29 2s. 4d. on the corresponding half year. An interim dividend of 4 per cent. for the six months was recommended. The report was adopted.

There was only a moderate increase in the rental of the Maidstone Gas Company during the six months ended Dec. 31 last, as compared with the corresponding period of the previous year. There was, however, a favourable improvement in the residuals account; and an interim dividend of 10 per cent. per annum has been declared for the half year on all the Company's stock. The working statement prepared by the Engineer and Manager (Mr. H. Smythe) showed that the make of gas for the half year had been 10,980 feet, and the sale 10,290 feet per ton of coal carbonized.

The half-yearly general meeting of the Newport (Mon.) Gas Company took place on Monday last week, when the Chairman (Mr. E. J. Phillips), in moving the adoption of the report), stated that the quantity of gas sold in the six months ending Dec. 31 last was 68,878,600 cubic feet; the amount received therefor being £10,145. The total revenue was £13,629; the expenditure, £10,103—leaving £3526 to go to the profit and loss account. This was an increase on the corresponding period of 1887, notwithstanding a reduction had been made in the price of gas. During the half year 2 million cubic feet more gas was sold than in the latter half of 1887, which would almost compensate for the quantity made by the Alexandra Dock Company for their own supply. The report was adopted; and dividends at the rates of 10, 7½, and 7 per cent. per annum were declared.

At the half-yearly meeting of the Reading Gas Company to-day, the Directors will recommend the payment of full dividends on all the stocks and shares of the Company. The amount available for this purpose, as shown by the accounts, is £14,392; but as the dividends for the six months will not amount to anything like this sum, there will be a good balance to carry forward. The Directors say they cannot speak too highly of the excellent manner in which the new works have been carried out by their Engineer (Mr. E. Baker, Assoc. M. Inst. C.E.), and of the successful way in which he has brought them into use.

The South Shields Gas Company will hold their annual meeting next Thursday, when the Directors will have a good report to present. There was a general improvement in the revenue last year, with a decreased expenditure to the extent of 2 per cent. The accounts prepared

by the Secretary (Mr. John H. Penney) show that the total revenue was £43,863; the expenditure, £27,080—leaving a balance of £16,783. With the amount brought forward (£505) added, this is increased to £17,288. After deducting £9330, the amount of the interim dividend and interest paid during the year, there is £7957 available for the second half-year's dividend of 5 per cent., with a small balance to carry forward. The sale of gas last year was 26,331,446 cubic feet, or 9 per cent. in excess of the previous year; and there was an advance in the sale of residuals equal to 15 per cent. The increasing sale of gas will render necessary the erection of additional manufacturing plant during the current year; and for this purpose the Directors will ask the shareholders for further capital to the extent of £15,000. The new sulphate apparatus put up at the works (which are under the management of Mr. W. J. Warner) last year is acting satisfactorily.

The annual general meeting of the Sunderland and South Shields Water Company was held last Wednesday under the presidency of Mr. R. Vint. In moving the adoption of the Directors' report, the Chairman said that during the past year the Company had made extensions to the extent of 4308 yards of piping, and put in new services to the number of 600. The water pumped during the year was 2072 million gallons—being a daily average of 5,680,000 gallons; and the grand result of their working was that they had received £57,676, which was an increase of £1847 on the year. Their working expenses had been £18,267—a figure something less than the previous year. Having paid the dividend on the first half year, they had a balance of £20,217 wherewith to pay the dividend recommended that day, which would absorb £15,639. They would therefore carry forward a good balance. The report was adopted. A dividend of 4½ per cent. on the ordinary preference shares of the Company for the half year ending Dec. 31, 1888, free of income-tax, was then declared; and interest at the rate of 5 per cent. per annum was ordered to be paid on the amount called up on the shares allotted on Sept. 3, 1875.

The annual general meeting of the Uxbridge and Hillingdon Gas Company was held last Tuesday, under the presidency of Mr. W. Fassnidge. The accounts presented showed a profit of £2611 for the past year. This, added to the surplus profits of former years, made a sum of £2804 available for division. The Directors recommended the payment of dividends (less income-tax) of 10 per cent. on the original shares, 7½ per cent. on the 1861 shares, and 7 per cent. on the 1873 shares. This absorbed £2597, and left a balance of £207 to the good. The Directors reported that the consumption of gas for the year showed a fairly satisfactory increase as compared with the previous year. The report was adopted, and the dividends recommended were declared. Votes of thanks were accorded to the Engineer and Manager (Mr. S. Penny, Assoc. M. Inst. C.E.) for his able management of the works; as well as to the Chairman, Directors, Secretaries, and office staff.

The fortieth annual report of the Directors of the Walker and Wallsend Gas Company, which was submitted at the meeting of the Company yesterday, stated that the undertaking had shared the improvement which attended the commerce of the Tyne during the past year. The consumption of gas had largely increased, and there were reasonable grounds for expecting that in proportion to the prosperity of the district would be the profits realized by the concern. The revenue account showed the year's income to have been £11,170; the balance carried to the profit and loss account being £3286.

At the 84th half-yearly meeting of the Wakefield Gas Company, held on Monday last week, the Chairman (Mr. W. Statter) congratulated the shareholders on the satisfactory account which the Directors had to lay before them as to the working of the concern in the latter half of last year. The quantity of gas made was 2½ per cent. more than in the corresponding period of the year 1887, and that unaccounted for was 2 per cent. less. The Company had now about 60 miles of mains, and an income of £30,000 a year. During the six months there had been sent out 200 additional meters, principally to new customers; and 411 cooking and heating stoves and 21 gas-engines were supplied from the Company's mains. Alluding to some remarks made at a recent meeting of the City Council by Alderman Peacock, with regard to the amount paid by the Corporation to the Company for lighting the public gas-lamps, to which reference is made in another column, the Chairman remarked that the Corporation obtained all they paid for, and perhaps a little more. The amount available for division was £5769 9s. 4d.; and he proposed that the following dividends should be paid:—£11 10s. per cent. on the old shares, £8 12s. 6d. on the £5 "B" fifths, and £8 1s. on the new £10 shares; and that the balance of £690 15s. 7d. be carried to the next accounts. This was agreed to.

The Directors of the Wellingborough Gas Company had a net balance of about £1700 available for distribution among the shareholders at their meeting yesterday, as the result of the working of the undertaking in the latter half of the past year. A dividend of 5½ per cent. for the six months was recommended. In the period reported upon, the Engineer and Manager (Mr. J. T. Lewis) carbonized 1952 tons of coal. With this, 20,489,100 cubic feet of gas were made, of which 19,345,700 cubic feet were sold; being 10,496 cubic feet per ton made, and 9911 cubic feet sold. The gas actually accounted for amounted to 19,519,000 cubic feet, or at the rate of 9999 cubic feet per ton. The quantity of coke for sale was at the rate of about 9¾ cwt. per ton of coal carbonized; and it produced £402 17s. 6d.

Horwich Gas Supply.—The Horwich Local Board have decided to take steps with the view of manufacturing their own gas for the supply of the whole of the township, which has developed at an exceptionally rapid rate in consequence of the establishment of the Lancashire and Yorkshire Railway Company. The Bolton Corporation Gas Committee have been asked to extend their mains in the township, but have declined—presumably on the ground that there would not be sufficient remuneration for the outlay; and this has caused the Local Board to take action.

Reductions in Price.—A reduction of 3d. per 1000 cubic feet is announced by the *Pinner Gas Company*, bringing the price down to 5s. 7d. per 1000 feet.——The *Wolverhampton Gas Company* announce a reduction of 2d. per 1000 cubic feet, to date from the last quarterly reading of the meters.——A reduction of 5d. per 1000 cubic feet has been made by the *Stow-on-the-Wold Gas Company*; bringing the price down to 4s. 7d. ——The *Chorley Corporation* have decided to reduce the price of gas 3d. per 1000 cubic feet, which will make the price 3s. 6d., including 3d. discount.

Sales of Shares.—At a recent sale, eleven £5 shares in the *Brompton, Chatham, and Rochester Water Company* realized £16 2s. 6d. each; eight similar shares, £16 each; and two others, £15 7s. 6d. each. Thirteen new shares in the same Company fetched £10 10s. each.——Last Thursday, Mr. F. Maddison sold by auction eight £10 shares in the *St. Neots Gas Company*—four at £18 10s., and four at £18 15s. each.——Some original fully-paid £10 shares in the *Altrincham Gas Company* were offered for sale by auction last week and realized from £21 12s. 6d. to £22 per share. A number of new shares, £7 paid, fetched from £12 to £12 2s. 6d. per share.

BIRMINGHAM CORPORATION GAS SUPPLY.

The Committee's Annual Report—Mr. Hack's Salary.

At the Meeting of the Birmingham City Council last Tuesday—the Mayor (Alderman Barrow) presiding—the Gas Committee's report, a summary of which was given last week, was submitted.

Alderman Pollack presented the report, and moved—"That the Gas Committee be authorized to appropriate out of the profits of the Gas Department for 1888, the sum of £25,000 to the credit of the improvement rate of 1888, and to add the balance of £15,915 15s. 2d. to the reserve fund." He said he thought the Council were to be congratulated upon the successful work of the Gas Committee during the past year; and he hoped that they had once more entered upon a cycle of prosperous years. The net profit of £55,315 realized in 1888 had only been exceeded on one or two occasions. In 1887 the profits were £27,445; and last year they were nearly double that amount. The reasons for this were not far to seek. The revenue from gas was £10,000 more; while the working expenses were only slightly in excess of 1887. Residuals yielded them £16,000 more; and the fittings accounts, which had in 1887 entailed a loss of £340, had given them a profit of £1121. The excess upon these items amounted to £27,213; and they accounted to a great extent for the additional profit now reported. The details of the revenue account were so clearly set out in the report that he need not further analyze them. He would merely point out that their surplus outlay for coal was only about £3000, and was no doubt owing to the additional quantity of coal carbonized to produce the extra £10,000 worth of gas. There had been an increase of £1815 in wages at the works, including the cost of holidays; and the increase in salaries, with the advances recently discussed, was £412. In regard to residuals, there had been an increased revenue of about £9000 from coke. There had lately been a great dearth in coke, not only in the district, but throughout the country, partly owing to the closing of those carbonizing establishments which treated coal for the purpose of producing residuals, and partly owing to the larger requirements of manufacturers, enabling the Committee to make better contracts. They had also increased the retail price from Midsummer last, which accounted for £2700 out of the £9000; and there had no doubt been an additional sum saved for labour through their being able to clear the coke-yards more rapidly. He did not expect that during the current year the revenue from this residual would be substantially increased—in fact, he should be glad if it could be maintained. Tar had also yielded them £5000 more. No residual had undergone greater changes in price than tar. A few years ago they were selling it retail at 50s. per ton; and two years ago contracts were made at 7s. per ton. The price was now about midway between these extremes, and appeared to be likely to be stationary. He did not think they could much improve the revenue from ammoniacal liquor, which last year gave them an additional £2000 over 1887, because the price of sulphate of ammonia was somewhat governed by the price of those nitrates of which they had lately heard so much, and the abundance of which had depreciated the market value. Large as this increase of £16,000 appeared, and large as was the total amount received for residuals—viz., £95,500—it was far below the amounts which they received in former years, and especially in 1882, when the price paid for coals (£135,000) was almost covered by the revenue from residuals. Had the Committee been able to obtain the same prices last year that were obtained in 1882, the £95,000 would have been £160,000. In 1883 the average charge for gas was 1½d. per 1000 cubic feet higher than last year; and the profits of 1882 were no higher than those now reported. They had, therefore, during the last six years—partly through the larger consumption of gas, and partly through saving in interest, but principally through improvements at the Windsor Street works and economical working—been able to recover first the reduction in price of 1½d. per 1000 cubic feet, and secondly the loss on residuals; the two items, at a low estimate, amounting to from £60,000 to £65,000. Referring to the capital account, the total amount of expenditure on the works was set down at £2,241,000; but if they deducted from this amount the sums they had in hand on account of the sinking fund and the reserve fund, including the sums dealt with in his resolution—the two items together amounting to £352,344—they would find that the amount outstanding as capital expenditure at Christmas last would be £1,890,000. Members of the Council were aware that the original price paid for the gas undertaking was £2,001,000; so that their indebtedness to-day was actually £111,000 less than it was in 1875. Notwithstanding this they had now a plant producing 3,500,000 cubic feet of gas, as against 2,300,000 feet in 1875. The £25,000 additional outlay was capable of producing an additional quantity of gas, which could not be estimated at less than 500,000,000 cubic feet. With regard to the disposal of profits, they had placed £14,400 to the new offices, which was the balance standing to the debit of that account. When the offices and Art Gallery were built, it was understood that their value on the books as an asset should not exceed £50,000. The cost of the building, however, was £112,000. Deducting the £50,000 he had named, and £25,000, the value of the old offices, it gave them a difference of £37,000, which had now been entirely liquidated out of profits. This left them, after deducting the £25,000, the usual amount which they paid over to the rates, with a disposable balance of £15,915, which the Committee recommended should be carried to the reserve fund. It was provided by Act of Parliament that, when the reserve fund should reach £100,000, the interest on this amount should be paid over to the rates; and this would mean practically a fixed contribution of £4000 a year. If the total balance of their profits last year had enabled them to make up the £100,000, the Committee would doubtless have recommended the entire sum to be carried to the reserve fund; leaving the liquidation of the balance of the offices account for another year. But they were £3000 short. They hoped, however, to make up the amount this year, as it would only require a surplus profit of £13,720, which there was every prospect of their realizing. When the reserve fund was made up, their contributions to the rates would consist of the £25,000 usually paid, an extra £4000 for interest on the reserve fund, £8150 in respect of public lighting within the city, and the interest on the capital for providing the Art Gallery. The question might occur to some of them whether the time had not arrived once more to reduce the price of gas; but a probable increase in the cost of coal facing them, and the competition of the electric light by an installation on a large scale, which was likely to come at no distant period, should induce them to stay their hand. There were also other matters which would require attention, and which might curtail their revenue; among them being the Claus ammonia-purifying process, which was being tried in Belfast, and which, if successful, would demand the serious attention of the Committee. Then there was the question of goodwill, which, although they had been writing it off pretty rapidly, was still a very large item in their capital expenditure; and also the fact that their contribution to the sinking fund was based upon the perpetual annuities in respect of the acquisition of the Staffordshire Company's undertaking being worth 25 years' purchase. That seemed to be a reasonable assumption fourteen years ago; but the annuities were now worth 30 years' purchase; and if they had power to redeem them, it would entail an additional expense to capital of £275,000. Their policy, therefore, should be in the

direction of laying by somewhat more; and he trusted the Council would approve their recommendations.

Alderman Powell Williams, M.P., seconded the resolution. He observed that he cordially approved of the policy by which the surplus profit was paid to the reserve fund, as it was important to raise the fund as early as possible to the £100,000, at which the interest would come into the funds of the Corporation. When the amount was made up, it would yield £3500 per annum. This sum was within something like £900 of what was necessary to make good the annual amount for sinking fund. They would, therefore, have a self-acting process, under which the total indebtedness of the Gas Committee would eventually be paid off. It was, however, more with regard to the total indebtedness that he was for the moment interested. The total amount outstanding at the close of last year was, in round figures, £2,066,000; and what had they upon the other side which they could set off against this sum? They had, first, £82,000 of the reserve fund, which would reduce the amount below £2,000,000. Then they had £85,000 in hand of working capital, either in cash or in stock, which would also come off; so that the gross sum with which the city was really chargeable, as debt in relation to the gas undertaking, was reduced to £1,800,000. To represent this they had land and buildings, including the Art Gallery and the offices of the Department, together with freehold land in various parts of the town, which, he was told, were valued by the Gas Committee at £375,000. This did not include manufacturing buildings and plant, the depreciated value of which was £275,000. This gave them an asset of £650,000. In addition to this they had plant and meters, which stood on the books at £245,000; gasholders, £375,000; and mains, about £300,000. The total of these figures was £1,570,000, as against an outstanding indebtedness of £1,800,000. In regard to some of the figures, however—such as those for mains—a reduction should be made from the amount standing on the books; and, therefore, taking the asset at half the amount mentioned, it would reduce their indebtedness to one million sterling. The £4000 a year paid to the sinking fund would extinguish this debt in 65 years; but if, instead of paying only £4000 a year, they were to pay in the £15,000 of surplus profit, as they had done in past years along with the proper instalment, which would make the contribution £20,000 annually, they would pay off the million which was strictly the outstanding obligation of the Gas Committee in 23 years.

Mr. Fallows made some comparisons of the Gas Committee's report with one he had recently received from the South Metropolitan Gas Company. The capital of the Birmingham undertaking, he said, was a little above, and of the South Metropolitan a little under, £2,000,000; while the gross profits were £472,000, and £487,000 respectively, and the net profits £152,000 and £165,000. The South Metropolitan Gas Company made their larger profits at much less cost; for they carbonized only 293,510 tons of coal, as against 373,779 tons in Birmingham during the same period. By comparing these reports, it seemed to him that there was something defective in the management of the gas-works in Birmingham.

After some remarks from members in regard to the gas annuities, the resolution was agreed to.

Alderman Pollack then moved—"That the salary of Mr. Henry Hack, the Engineer at Saltley and Swan Village works, be increased from £900 per annum, with an allowance of £50 per annum for house, to £1050 per annum from the 1st of July, 1888, inclusive of allowance for house." He remarked that Mr. Hack had practically had no increase in his salary since 1882; and the advances prior to that time were all made voluntarily. He made no application; but the Committee felt satisfied with his work, and offered him the additions to his salary. The output at Saltley since the transfer had been enormously increased. Mr. Hack, too, had carried out work of the value of £180,000. When Mr. Hack heard of Mr. Hunt's increase, he reminded the Committee of the promise which they had made that the two Engineers should be placed on an equality; and he asked to receive an addition to his salary equal to that granted to Mr. Hunt. The Committee regarded the work of the two Engineers as of equal value; and they could not do other than recommend the increase. With reference to what had been inaptly termed the "dual control," he said that as long as the Committee had reason to be satisfied with two Engineers, the question of one would not come practically before them. If it was necessary to transfer two Engineers when the output was barely two-thirds of what it was at present, it seemed certain that the services of two were required now. If they had one Engineer to take charge of the four works, he would require much higher pay; and he would also need an Assistant Engineer to take charge of the distribution. It had been said that greater expenditure was incurred by employing two Engineers, inasmuch as one tried to out-do the other; but he thought it was an advantage to the department that each Engineer should endeavour to achieve the best results. One man alone at the head of the works was more liable to make a great mistake than two, and each criticizing the other's work. They had recovered a loss of 40 per cent. on residuals since 1882; and whereas at the time of the transfer each ton of coal produced only 9000 cubic feet of gas, it now yielded nearly 10,000 feet. The Committee would certainly hesitate before they advised a change.

Mr. Lancaster seconded the motion.

Mr. Bloor proposed, as an amendment, that the question of raising Mr. Hack's salary be deferred. He said that the great burden of Alderman Pollack's speech had been that they must increase Mr. Hack's salary, because they had raised Mr. Hunt's. That was not sufficient reason for him to vote for the raising of any man's salary. He hoped the Committee were aware of the straightened condition of things at Saltley. He did not know of a manufactory in the town where there was greater ill-feeling between a manager and his men than existed at Saltley. Ten or eleven men left *en bloc* within a month of that day; and within a fortnight Mr. Hack had reduced the wages of a number of men 5s. a week. And after this, he (Mr. Bloor) was asked to vote for his salary to be advanced. He knew it would be said that the men, if they had any grievance, could complain; but he also knew, as the men knew, that if they complained they would run a very great risk of being discharged. The men were oppressed; and it seemed astonishing to him that if Mr. Hack possessed all the ability he was said to have, he could not find means whereby a smaller number of hours than eighty-four per week should be worked by some of the men there. There were men employed at Saltley who were not more than forty years of age, but whom anyone would guess to be sixty years old. The men's lives were being reduced ten or fifteen years. He hoped the resolution would not be pressed, at any rate until inquiries had been made into the conditions under which the men worked.

Mr. Brinsley, seconding the amendment, hoped Alderman Pollack would withdraw his resolution after the statement by Mr. Bloor.

Mr. Stringer said that Mr. Bloor's speech was one of the most extraordinary he had ever heard during his membership of the Council. He hoped, however, that the increased prosperity of the Committee would enable them to grant the increase.

Mr. Manton did not think Mr. Bloor's speech should be allowed to pass without comment. He was a visitor to Saltley on behalf of the Gas Committee; and if what Mr. Bloor stated were correct, it was very extraordinary. He had honestly done his best to get a correct idea as to whether there were any grievances as between the men at Saltley and the officers; but he had failed. It was a difficult thing to go behind one's officers, and get at men who were under their control. He wished that the statements were made with more distinctness, and that the proofs were furnished to the Committee, who, he was sure, were desirous of putting an end to any grievances which they knew to exist. If the men would not come forward themselves, it was impossible to do anything for them. He would support the resolution.

Mr. Towler remarked that he had not heard any solid argument in favour of the increase in Mr. Hack's salary. There was no tendency to increase the wages of the workmen; and why should the chief officers receive advances time after time? One Engineer, in his opinion, was sufficient to perform the duties.

Alderman Cook said the charges which had been made were of a very serious character; and, as far as he could ascertain, none of the members of the Committee seemed to know anything about it. It seemed to point to this—that the Committee gave the Managers power to reduce wages without apprising them; and if this were so, he could easily understand the Committee often being placed in great trouble. The question of reducing wages ought to be brought before the Committee; and he hoped the Chairman would undertake to inquire into the whole matter. He should, however, support the proposed increase.

Mr. Lowe opposed the resolution, on the ground that he believed the Council could not afford to pay so many high salaries to leading officials. He did not think there was any necessity for a second Engineer. The reasons stated in the report for the increase were altogether childish and absurd; and unless a great deal more came out than had already, the proposal ought to be rejected by an overwhelming majority.

Mr. Granger thought the discussion showed the evil of dual control. He did not think the Committee could go forward in face of the grave statements made. Mr. Hack, to show that a saving had been effected at Saltley, had reduced the wages of a body of men 5s. per week. He had never heard a single individual connected with Saltley say a word in Mr. Hack's favour.

Mr. Lancaster asked if he could withdraw from seconding the resolution after what had been stated.

The Mayor said he could not, without the consent of the mover.

Alderman Dr. Barratt thought it unadvisable that the debate should go any further. They had heard sufficient to make them feel that they could not go home contented, unless they knew that a most searching inquiry would be made. If the allegations against Mr. Hack were proved, it would not be a question of whether he should have his salary increased, but whether they could permit him to remain longer in office.

Alderman Pollack said he had no objection to accept the amendment. What Mr. Bloor had mentioned was absolutely sprung on the Committee; they had never heard of it. Ten or twelve days ago he had an hour's conversation with Mr. Bloor; and they discussed the question of grievances at the works. He (Alderman Pollack) visited the works, and spent almost a day there; but he never heard anything of the complaints now brought forward, nor was anything said to him on a subsequent occasion when he saw Mr. Bloor. A short time ago he asked Mr. Hack whether there was any truth in the statement that men had been arbitrarily treated; and he said that he had had the foremen before him and questioned them, and they stated that they knew of nothing that could be so interpreted. Grievances would spring up suddenly; and they would not have peace until it was known that they had a regulation at the works by which each workman, if he had a grievance against his foreman or against an Assistant Engineer, had a right to appeal to the Engineer; and, if he received no satisfaction from the Engineer, he was at liberty to appeal directly to the Committee. He wished that to be known by every man at the works; and no man need fear that it would be to his detriment if he made his complaint to the Committee. There was no reason to suppose that the members of the Committee were less anxious for the welfare of the men than Mr. Bloor or Mr. Granger.

Mr. Bloor explained that the complaints which he had mentioned did not reach him until Sunday; and it took him all day Monday to verify them. He therefore had not had an opportunity of mentioning them to Alderman Pollack.

The Mayor: I understand that for the present the resolution is withdrawn; and I will take the amendment as the substantive resolution.

Mr. Bloor's motion was then put and carried.

A meeting of the Works Sub-Committee of the Gas Committee was held last Thursday, under the presidency of Mr. Alderman Pollack (Chairman of the Committee), when the allegations made by Mr. Bloor at the Council meeting on the previous Tuesday, with regard to the relations existing between the Engineer and the *employés* at the Saltley works, as reported above, were referred to. According to the *Birmingham Post* of Friday last, "the matter was not discussed; but the Chairman of the Committee and Mr. Manton will make inquiries at the gas-works preparatory to the formal inquiry which the Committee at its meeting on Monday next [yesterday] will doubtless decide to institute." Our contemporary has been informed that "the grievance, so far as it relates to the reduction of wages, concerns only a few men, whose wages were, owing to an inadvertence, overpaid for a considerable period. According to one account, the Manager raised the wages of the men 5s. per week each in May last year. This excess was continued until the present month, when Mr. Hack heard of the increase, and issued an order for the old rate of wages to be reverted to."

The Ridsdale Railway Lamp and Lighting Company, Limited.—Last Friday, Mr. Justice Stirling, on the application of creditors who petitioned to wind up this Company, appointed the Secretary (Mr. A. J. Collins) to be Provisional Liquidator.

Additional Powers for the Bristol Water Company.—A special meeting of the Bristol Water Company was held last Saturday, for the purpose of approving of the Bill promoted by the Company to obtain additional powers. The Chairman (Mr. E. Bush), in moving the approval of the Bill, explained that when the Company last went to Parliament, the Legislature did not see fit to grant them pumping powers; it being the first time such powers had been refused to any Company. The new powers would enable them to take the springs as well as the Yeo stream in Somerset, down to the foot of the new reservoir which would be constructed across the valley, at a cheap rate, and enable them to save an immense quantity of water, and permit a daily flow through the district of 1,900,000 gallons. The reservoir would hold 1500 million gallons. The Company would take their time in constructing this, so as not to burden their revenue more than could be helped; and therefore they had put down ten years as the period of completion. In answer to some shareholders, the Chairman said the Directors did not anticipate anything like serious opposition to the Bill. They were not abandoning the water powers of last year, but only the mode of bringing the water into the Company's works. The new works would cost something like £200,000. The resolution was unanimously agreed to.

THE POSITION OF THE TAUNTON ELECTRIC LIGHTING COMPANY, LIMITED.

The shareholders of the Taunton Electric Lighting Company, Limited, had before them, at their recent meeting, the accounts for the past year; and, as the result of the statement presented to them in regard to the position of the Company, a dividend of 6 per cent. (an increase of 1 per cent.) was declared. In view of this fact, a few particulars from the accounts may be interesting. The Company received last year for lamp-rental, electric apparatus sold, and installations carried out, £2471 14s. 10d.; and the stock in hand was estimated at £340 19s. 10d.—making a total of £2812 14s. 8d. The expenditure for new apparatus and renewals amounted to £541 17s. 10d.; salaries and wages, to £529 18s. 3d.; hire of plant, to £261 19s.; coal and firewood, to £442 7s. 8d.; and interest on debentures and bank interest, to £176 4s. 9d.—a number of small payments making up a total of £2305 1s. 8d. Adding to this the value of the stock in hand on Dec. 31, 1887, £151 14s. 9d., there was left a profit balance of £355 18s. 3d. The amount brought from the previous year was £123 15s. 11d.; consequently there was for disposal £479 14s. 2d The dividend, at 6 per cent., came to £272 0s. 5d.; leaving a balance of £207 13s. 9d. to be carried forward. The Company's paid-up share capital is £4750; and they have raised £3000 on debentures—total, £7750. They have expended on plant, machinery, preliminary expenses, &c., £7879 0s. 10d.; so that they have a debit balance of £129 0s. 10d. on their capital account. The statement of assets and liabilities is as follows:—To rents and accounts for installations due, £1203 6s. 6d.; stock-in-trade, £340 19s. 10d., balance from capital account, £129 0s. 10d. By balance due to bank, £617 19s. 1d.; liabilities, £575 13s. 11d.; balance, £479 14s. 2d. The cash account shows on the debtor side a balance of £376 8s. 9d. at the bank on Dec. 31, 1887; receipts on capital account during the year of £385; income account, £1760 3s. 10d.; balance due to bank, £617 19s. 1d.—total £3139 11s. 8d. Against this there are credited: Payments by cheques not presented on Dec. 31, 1887, £364 12s. 11d.; liabilities due Dec. 31, 1887, £92 13s. 8d.; expenditure on capital account, £760 17s. 10d.; expenditure on income account (£2305 1s. 8d., less £575 13s. 11d. unpaid), £1729 7s. 9d.; dividends paid, £191 19s. 6d.—total, £3139 11s. 8d. Such are the figures as presented to the shareholders; and upon them a few comments may be made. Of the £2471 14s. 10d. received on account of business done, a large proportion (probably more than £1000) was, we believe, for work outside Taunton—for temporary installations at Exeter, Weston-super-Mare, Bath, &c.; and as the sums received locally in the two first-mentioned towns are known to be very small indeed, the question arises as to who paid for these installations, and what was the profit on them. There is every reason for supposing that the temporary installation at Bath paid very well, and that the Taunton Company made a good thing out of it; but it is doubtful whether in the Company's head-quarters they earned an extra £10 note. At the same time it should be acknowledged that more business could be done at Taunton if the plant were large enough. Although the shareholders are receiving a higher dividend than was paid last year, this cannot be taken as an indication that the concern is flourishing. The Company owe their bankers £618, and other people £575—together, £1193. Against this, however, they have £1203 owing to them; so that if they could collect their assets and discharge their liabilities, they would have £10 and their stock-in-trade wherewith to pay their dividend. The Directors admit that they are in need of additional plant; and, inasmuch as they can scarcely at times keep their lamps alight with what they have, this admission is almost superfluous. Their two engines, purchased two years ago, and then in excellent condition, are now found to be very wasteful in working (entailing an expenditure of £200 a year in coal); and more money is required for the purchase of others of a superior kind, so that these may be kept in reserve in case of a breakdown. The Company have made strenuous efforts to get additional capital; but, as will be seen from the foregoing figures, they only raised an extra £385 last year. It is so badly wanted, however, that the increased dividend—scarcely justified, we should think, in view of the position of the concern—has apparently been resorted to in the hope of obtaining it. We understand that the bulk of the subscribed capital is held by the original promoter or promoters of the Company.

THE PUBLIC LIGHTING OF WAKEFIELD.

At the last Meeting of the Wakefield City Council—the Mayor (Alderman W. H. Lee) presiding,

Alderman Peacock, pursuant to notice, moved "That a Committee be appointed to consider the question of adopting the electric light for lighting the city, instead of the renewal of the gas contract." He said that all the members would be aware that it was his intention to bring forward this question, as the contract with the Gas Company would shortly expire. He found that the Corporation paid more than £1908 per annum to the Gas Company for the public lighting of the city, including the public buildings; and he had an estimate showing that the lighting by electricity could be done for £995. The introduction of electric lighting was only a question of time; and its adoption in Wakefield was only a question either of the near future or of a later period. If they could have electric lighting in the city for £995 a year, it would not be wise to pay about £2000 a year for gas. From time to time statements had been made that the Corporation were paying for 4-feet gas-burners in certain of the thoroughfares, but only 3-feet ones in the back streets; and certain members of the Committee thought the Corporation were not getting what they paid for, and that they were paying for a considerable amount of gas over and beyond the quantity they were receiving. This question had been thoroughly gone into in Committee. Their Gas Inspector made a test; and he was satisfied the Corporation were not obtaining all they paid for, and that many lamps were only consuming 3½ feet, and some less, while the Corporation were paying for 4 feet. There was here and there an isolated lamp, however, where they were getting more than this quantity. It had been also stated that the pressure was taken off at eleven o'clock at night; and if they were getting less than 3 feet of gas up to that time, the probabilities were that the Corporation were not getting more than 2½ feet of gas after that hour, though they paid for 4 feet. He thought it was unwise to go on with this very unsatisfactory state of affairs if the Corporation could have the electric light for £995. This estimate had been furnished by an eminent electrical engineer, who would be very glad to have an interview with the Committee, when appointed. He (Alderman Peacock) thought the question was of sufficient importance to justify the appointment of a Committee to investigate and report upon the whole matter.

Mr. M'Gibr said that he was a little startled by the disparity of the price now being paid by the Corporation and the price at which it was alleged electric lighting could be introduced. But whether that was so or not, one matter had struck him. It seemed to him to be somewhat a justification of certain observations he made some time ago when protesting against the way in which the town was lighted. On that occasion Alderman Peacock said that Wakefield was the best-lighted town in England. But people changed their minds; and Alderman Peacock seemed to have arrived at a different opinion. He was quite at one with Alderman Peacock, if the latter was prepared to give some kind of undertaking that the figures he had mentioned could be relied upon. If Alderman Peacock succeeded in bringing about such an important change as a saving of 2d. or 3d. in the rates, the public would recognize him as a benefactor. He did not think that the Corporation were cheated by the Gas Company; and he did not believe the Company gave them less gas after eleven o'clock at night, for the matter had been sifted. Whether or not the Corporation had been paying too much for gas was another question. He rather thought they had. He deprecated the appointment of any other Committee; there being one in existence which could deal with the question.

Alderman Reynolds said he had some five years' experience in electric lighting in establishments of his own firm; and he thought there could not be two opinions with regard to the desirability of having the light where it could be obtained. It would be wrong, however, on his part to allow Alderman Peacock's statement to go forth without some qualification of it. He did not know that it was even possible to light the whole of the streets of Wakefield with electricity at present; but certainly it could not be done for the sum named by Alderman Peacock. The electric light had been installed at Eastbourne, Exeter, and Bath; but he was not sure that all the streets were lighted in those towns, but only the main thoroughfares. He did not think that the gentleman referred to by Alderman Peacock would propose for a moment that the Corporation should light the whole of the streets of Wakefield with electricity; but if the question was to be entertained at all, the most feasible step was to get reliable information.

Alderman Milthorp considered it would be better to let the matter alone until the Corporation were in a position to avail themselves of the experience gained by other towns.

Alderman Peacock explained that he had procured his information from two sources; and one of them was slightly contradictory to the other. Certainly he should not like to commit the Council without going fully into the matter. With regard to Mr. M'Girr's statement as to the gas supplied to the Corporation, he (Mr. Peacock) took no responsibility for any report by the Gas Inspector. Under the circumstances, he thought it would not be out of place to appoint a Committee.

The Mayor said he approved of this question having been brought before the Council for consideration; and he had no doubt that the matter would not be lost sight of by the Sanitary Committee. One thing, however, was certain, that it could not be disposed of prior to the time when the contract with the Gas Company would have to be renewed.

Permission to withdraw the motion was then granted.

THE ELECTRIC LIGHTING EXPERIMENT AT BARNET.

The Expert's Report on the Lighting—More Grace given to the Contractor.

At the Meeting of the Barnet Local Board last Tuesday—Mr. C. Stevens in the chair—a report by Mr. W. H. Preece on the subject of the electric lighting of the town, together with one by his assistant (Mr. Probert) on his photometrical testings of the lamps, was under consideration. Mr. Preece's report was as follows:—

W. H. Mansbridge, Esq. *General Post Office, London, Feb.* 11, 1889.

Dear Sir,—In accordance with the request contained in your letter of the 23rd of January, and with the resolution of the Board passed on the 15th of January, I have pleasure in informing you that I visited Barnet on the 28th ult., in company with Mr. Joel, and inspected the whole of his arrangements there. My assistant, Mr. Probert, an expert in light measurements, visited the locality on the 2nd and 4th inst.; and I attach his report to me on the result of his photometric measurements. I answer now the several questions you have asked me.

1. *Q.* Are all the 71 lights of 32-candle power each? If not, of what power are they?—*A.* It will be seen from Mr. Probert's report that the lamps are not all of the candle power specified.

2. *Q.* Is the machinery now employed capable of supplying the 71 lamps with 32-candle power light?—*A.* The machinery now employed is capable of supplying 71 lamps with 32-candle power light.

3. *Q.* Can you give us any data whereby in the future we may determine for ourselves whether we are getting the amount of light stipulated for in the contract?—*A.* It would be difficult to measure the light except by photometric means, which require the services of an expert, but which are not difficult to master.

4. *Q.* Are all the lamps of uniform power?—*A.* The lamps are not by any means of uniform power.

5. *Q.* Would the present machinery be capable of working another 12 or 15 lights?—*A.* The present machinery might be capable of working another 12 or 15 lights; but it would be most impolitic to add more lights without additional apparatus to provide against the possibility of a breakdown.

I consider that it is a great risk to continue the lighting of your roads and streets with the existing apparatus. The whole of the apparatus in the central station worked by the contractor should be duplicated. I am sorry to see that such an interesting experiment as the illumination of your parish has been jeopardized by insufficient means to maintain the light uniform and steady.

(Signed) W. H. Preece.

[Enclosure.]

In submitting the results of my photometric measurements of the electric lamps in the streets of High Barnet, I beg to add that during the two evenings of Feb. 3 and 4 the lights were, in my opinion, all that could be desired. There is, however, a marked variation in the strength of light given out by the lamps tested. This may be due to absorption of light by the thick glass globe which encloses the electric lamp; to atmospheric absorption; to dirt or grease on the globe obscuring a large proportion of the luminous rays, and to the lamp filaments having deteriorated through use. For absorption, &c., I think the measurements might justly be increased 20 per cent. at least to represent the actual candle power of the lamps; and I have therefore in the annexed table furnished a column which shows the results of 20 per cent. augmentation. With this addition, the average candle power of the lamps, numbered 1, 10, 22, 33, 37, 43, 44, 48, 53, and 58 is 27½. The mean candle power for the electric lamps, as measured photometrically, is 22·71. The gas-lamp was found to equal 12·48 standard candles; hence the average illuminating power of the former shows a percentage increase of 40·6 as compared with the latter.

Appended to the report was a table giving the following figures:—

Lamps Tested.	Candle Power.		Candle Power with 20 p. ct. for Absorption.
Hadley Green	21·423*	..	25·70
High Street (tenth lamp from Hadley Green)	36·378	..	43·65
Do. (first lamp from station)	100·000	..	120·00
Do. (junction with Wood Street)	105·670†	..	126·82
Park Road	14·450	..	17·34
Manor Road	15·340	..	18·34
Black Horse	25·837	..	31·00
Bells Hill	22·700	..	27·24
Wood Street (top)	14·650	..	17·58
Union Street (second lamp from High Street)	22·457	..	27·00
The Avenue (third lamp from Black Horse)	34·269	..	41·123
Salisbury Road	19·563	..	23·475
Gas-lamp at top of Barnet Hill, which should be 16-candle power	12·480	..	14·98

* The contract power of the lamps is 32 candles.

† This was a "Sunbeam" lamp, put up for exhibition. It has since been removed, and replaced by an ordinary lamp.

A discussion followed the reading of the reports, in the course of which

Mr. JAMES said there was no excuse for the electric lighting contractor. The difference between the gas and the electric lamps should be 100 per cent.; but the expert's report showed the average of the electric lamps to be only 40 per cent. higher than the gas. The contract was for lamps of 32-candle power; and it was obvious that the contractor had not fulfilled his agreement. The report showed what the Board had long known—viz., that the whole thing was unsatisfactory. Mr. Joel had promised amendment time after time, but there had been no improvement; and therefore the Board ought now to protect the ratepayers by calling upon the contractor to fulfil his contract or determine it. He (Mr. James) made a report on the lighting during January; and he now had one for February, for the accuracy of which he was responsible. It was as follows:—

Feb. 2, lights very poor over whole of district. 4th, do. 5th, very bad up to seven o'clock; better after. 6th, very poor lights; all out from 7.10 until 10.15, then very poor; all out at 12.20; no oil-lamps up at 12.45. 7th, Wood Street junction lamp out from 6.50 until 8.20. 8th, all lit; better generally. 9th, lamp by Vicarage out until 7.30. 10th, junction lamp out at 10.40; not relit. 11th, junction lamp not lit until 6.45; all out from 10 to 10.7. 12th, all lights very bad until 7.20; improved. 13th, lamp at Black Horse out at 10.30; not relit. 14th, poor lights; all out 6.30 to 6.37; one in Salisbury Road not relit; junction lamp out from 11 till 12.20. 15th, all very bad; out from 6.30 until 7.30; better until 9; again bad; junction out all night; no oil-lamps at 12.40. 17th, all out at 8.58 to 9.10, after poor light; all out at 12.25. These observations are not to be taken as representing the whole of the failures that have occurred, as it is quite possible other lamps have failed at different times without my being on the spot to notice them. There have also been times when the light had been very poor which I have not noted here; my object being to call the attention of the Board to the worst cases of failure only.

On the reports of the experts, he thought the Board were bound to act decisively; and he therefore moved that the contractor be given 14 days' notice to remedy defects; and that, on failure, the contract be determined by such notice. He added that the contractor could not complain that he had been harshly dealt with, having had five months in which to give what he contracted to supply.

Mr. WALKER remarked that Mr. Probert's report of the light on the 2nd and 4th inst. was in direct contradiction to Mr. James's report. The expert said the lights were "all that could be desired."

Mr. JAMES said he had no objection to put his statement of fact against Mr. Probert's; for it was well known that the light varied very much in a short space of time. But there was a grave discrepancy in Mr. Probert's report; for after saying the light on the 4th was "all that could be desired," his figures showed that, whereas the contractor undertook to give lamps of 32-candle power, some of them were of only 14-candle power. Mr. Probert's assertion about the light was flatly contradicted by his own measurements; and the assertion was valueless in the light of known facts.

Mr. POOLEY seconded the motion; saying the Board had no right to favour Mr. Joel or any other man. In the interests of the ratepayers, they should demand what they paid for, and keep the contractor to his agreement.

The CHAIRMAN said he was very dissatisfied with the way in which the contractor was treating the Board. For the past ten days the light had been so uncertain that one could not depend upon it at all; and he could not ignore Mr. Preece's report as to the risk of continuing without duplicate plant, and his expression of opinion that Mr. Joel was jeopardizing an interesting experiment by failing to provide adequate appliances. He (the Chairman) did not condemn the electric light; but he must condemn the contractor for not doing his duty.

Mr. COWLES said he was not satisfied with the light; but he considered the Board would be getting on to dangerous ground in attempting to determine the contract. He thought the first step should be to call upon the contractor to provide lamps of 32-candle power.

Mr. SAMUELS agreed with Mr. Cowles, and urged that, before taking the step recommended in the motion, the Board should communicate with Mr. Joel.

Mr. SCHMIDT contended that to pass the resolution would be an injustice to the contractor, antagonistic to the interests of the town, and useful to nobody. Mr. Joel had ordered duplicate plant, and would probably have had it there but for being worried continually by such proposals as the one before them. The light was more successful in Barnet than it had been anywhere.

Mr. WALKER observed that some remedy was required for the present state of things; but it was not to be obtained by giving the contractor notice to determine the contract. The average of the twelve lamps tested showed the town was getting something over the contract light; but it was unequally distributed. He would move, as an amendment—"That the contractor be called upon to provide uniform lights of 32-candle power."

Mr. JAMES said it was the unanimous feeling of the Board that the contractor had failed to fulfil his agreement; and the report showed that he was not in a position to do what he had undertaken, because he could not supply further lights without risk to the whole. After five months of promises, the Board were still in the same position as when they started; and it was a waste of time to delay decisive action. All he asked was that the contract should be fulfilled, and that the town should have what it paid for.

The CHAIRMAN suggested that Mr. Walker should specify some time in his amendment.

Mr. WALKER said he would put in "fourteen days."

Mr. SAMUELS seconded the amendment, and it was carried by 5 votes to 4 (the Chairman and one member abstaining from voting).

PROPOSED ELECTRIC LIGHTING AT HARROW.—Last Tuesday Mr. R. E Crompton addressed the ratepayers of Harrow on the subject of electric lighting. He thought £6000 would provide the necessary plant for the supply of the 3000 lights which he reckoned would be required; and he considered that a dividend of 10 per cent. could be earned upon this sum. He put the cost at £1429 a year, and the income at £2400. Several questions were put to Mr. Crompton, who stated that he did not wish to take the public lighting of the streets unless he was obliged to do so; and he believed there was still a future for gas as a heating power, while, of course, it would always command some of the lighting. After some discussion, a vote of thanks was accorded to Mr. Crompton.

SALFORD CORPORATION GAS SUPPLY.—A Salford newspaper learns that the Gas Committee have under consideration the advisability of further reducing the price of gas by 4d. per 1000 cubic feet to consumers inside and outside the borough, and that it is probable the reduction, whatever it is, will take effect from the 25th prox. It is reported by the same paper that a discussion, "characterized by much heat," has been proceeding for some weeks in the Gas Committee as to the transfer of £60,000 of the £87,000 accumulated on gas-works depreciation account to the borough fund. The result of the discussion is said to be a resolution in favour of the transfer; and the matter is expected to come before the Town Council for confirmation at an early meeting. The subject has received the attention of the professional Auditor of the Corporation accounts, who has made special reference to it in his last report.

THE METROPOLITAN BOARD OF WORKS AND THE GAS AND WATER SUPPLY OF THE METROPOLIS.

In our editorial columns recently, reference was made to the concise account given by the Metropolitan Board of Works, in their report for the past year, of their general proceedings in connection with the gas and water supply of the Metropolis during the 33 years of their existence. The statement constitutes an important chapter in the history of these two great Metropolitan questions; and therefore it will be of interest to reproduce it practically in its entirety.

In the introductory paragraphs of the report it is explained that, as the powers of the Board will lapse on the 31st prox., and will be assumed by the newly-created County Council for London, the present is a favourable opportunity for "giving an account of their stewardship." They consider that by briefly describing the condition of London in 1855, and by tracing the alterations and improvements effected since that date, they may bring home to the mind of the Londoner of 1888 how much more favourable are the conditions under which he lives, in point of health, comfort and convenience of every kind, than were those of the generation immediately preceding, which witnessed the passing of the Metropolis Management Act, 1855. The better state of things, the Board acknowledge, is due in part to the social, political, and financial reforms of the last thirty or forty years; but, after making full allowance for these, they think the improved conditions of life in London are to be attributed to their own works and those of the subsidiary local bodies created by the Act above mentioned.

Leaving for the present the subject of water supply (which, with the portion of the report relating to the work of the Board in connection with the main drainage of the Metropolis, will be dealt with in a subsequent issue), we reproduce the chapter on

GAS SUPPLY.

In the year 1855 the condition of the gas supply of London was very different from what it is at the present time. There were then more than 20 different Companies supplying gas within the area under the Board's jurisdiction. Their districts were not defined. The pipes of one Company often ran side by side with those of another, or perhaps of two others; and there was sometimes a keen competition for business. This state of things, besides being bad for the Companies, was productive of many inconveniences to the public. When in one street there were pipes of several different Companies, the ground had necessarily to be broken up oftener, and the traffic was impeded more than if the pipes of one Company alone passed through the street. The expenditure of the Companies was also much greater; and this, of course, had its effect on the price charged for gas. The commodity was bad and dear, and there was no public control over it. No powers in this respect were given to the Board by the Metropolis Management Act; and consequently the Board was unable to interfere in any way.

In the year 1860 the principal Gas Companies, 13 in number, having come to an agreement to put a stop to a state of things so unsatisfactory to themselves, an Act of Parliament was passed confirming the arrangement made by them, according to which each Company was to have in future a separate and defined area of supply. This statute prescribed that the Companies should supply gas of 12-candle power and of a specified purity. It also required the Local Authorities—that is to say, the Vestries and District Boards—to appoint an examiner to test from time to time the lighting power and purity of the gas, with a view to seeing that it was of the prescribed quality. The Act limited the price of gas in ordinary circumstances to 4s. 6d. per 1000 cubic feet; but enabled a Company, in the event of an increase in the cost or other circumstances warranting an advance, to increase the charge to a maximum of 5s. 6d. per 1000 cubic feet. The conditions imposed by this statute were intended to afford to gas consumers and the public generally some equivalent for the increased powers and advantages which were at the same time granted to the Companies. So far as any advantage to the public was concerned, however, the Act was, after some years, found to be quite ineffectual. The Companies, on the other hand, had every reason to be satisfied with it, for it largely increased their dividends, and raised proportionately the value of their property.

Towards the year 1866 there was some public agitation on the subject; and in that year the City Corporation applied to Parliament for power to make and supply gas within the City. The Bill was referred by the House of Commons to a Select Committee, with instructions to inquire into the operation and results of the Act of 1860. The Select Committee, after hearing evidence, made a special report, in which it was stated that the gas supplied to many large cities and provincial towns was both purer and cheaper than that supplied to London; that the purification of the London gas was imperfect; and that since the passing of the Act of 1860 the price had been increased, whilst the lighting power of the gas had diminished. To remedy this, the Committee recommended, in the interest of the consumers, that there should be a more complete system of supervision over the Gas Companies. The Bill of the Corporation was not passed; neither was another Bill introduced in the same session by persons who had acted quite independently of the Board, and whose object was to enable the Board and the Vestries and District Boards or the City Corporation to purchase the works of the Gas Companies, and to undertake the supply of gas in future.

Towards the end of the year 1866 the Board received a communication from the President of the Board of Trade, to the effect that the Government intended to introduce into Parliament in the following year a Bill with reference to the supply of gas in London, and wished to know the Board's views on the subject. The Board was asked to consider (1) in the event of the Government deciding to propose a more efficient control over the Gas Companies, and to vest such control in the Board, what should be the conditions of such control; and (2) in the event of the Government proposing that the Board should have power to purchase the Companies' undertakings, what, in the Board's opinion, should be the terms of the purchase. The Board, having deliberated upon these two courses, expressed the opinion that if the alternative of public control were selected, the maximum price of gas should be fixed at 3s. 6d. per 1000 cubic feet; that the lighting power should be equal to 18 candles; that the standard of purity should be higher than that fixed by the Act of 1860; and that the gas should be continually tested by officers appointed by the Board; also, that the accounts of the Companies should be examined by a public auditor. On the other hand, should the Government prefer the alternative of purchase, the Board was of opinion that the purchase-money should not in any case exceed what would be equivalent to a fixed charge of 6 per cent. on the paid-up ordinary capital, the holders of which were entitled to, and in receipt of, a dividend of 10 per cent. under the Gas-Works Clauses Act, 1847.

The Government eventually decided that the measure to be submitted to Parliament should be one for the regulation and more effective control of the Companies, including the requirement that the gas should be of better quality and be supplied at a lower price; and that the Companies' profits should be made to some extent dependent on the quality of the gas they supplied. A Bill for this purpose was accordingly introduced

into the House of Commons early in the year 1867 by Sir Stafford Northcote, then President of the Board of Trade. Having been read a second time, it was referred to a Select Committee, of which the Right Hon. E. Cardwell was Chairman, and which heard the evidence of a good many witnesses, some being produced by the Board. The Bill was, as might be expected, opposed by the Companies; but a counter-proposal submitted by them the Select Committee considered unsatisfactory. Eventually, the Board of Trade having proposed to amend the terms of the Bill in a way which the Board was of opinion was not sufficiently favourable to the consumer, whilst the Gas Companies considered it not liberal enough to them, the Select Committee decided not to recommend the passing of the Bill, and made a special report to the House, suggesting that if the Companies would not consent to a proper amendment of the Act of 1860, the remedy would be for Parliament to concede to the Board, the City Corporation, or other Local Authorities, the power of supplying gas in their respective districts.

In the following year (1868) the City Corporation introduced a Bill providing for an independent supply in the City. Another Bill was at the same time introduced, by a private member acting on behalf of the delegates of a number of Vestries and District Boards, proposing that the Board and the City authorities should have power to acquire the Companies' undertakings, and to make and supply gas in future; or, as an alternative, that there should be an effective public control, and that the Companies should be required to supply better gas at a much lower price. These Bills were referred to another Select Committee; and the outcome of the inquiry was the measure known as the City of London Gas Act, 1868. By this Act it was provided that in the City of London and in other parts of The Gaslight and Coke Company's district outside the City, gas of 16-candle power should, from Jan. 1, 1870, be supplied at a price not exceeding 3s. 9d. per 1000 cubic feet. Both price and illuminating power were, however, to be subject to revision in the month of January in any year, if application for the purpose were made to the Board of Trade. In the event of such an application, the Board of Trade was to appoint three Commissioners, who, in making the revision, were to have regard to the declaration in the Act that the price and illuminating power were to be such as would, with due care and management, yield a dividend in that year attaining as nearly as might be, but not exceeding, 10 per cent. The Act provided for an audit of the Companies' accounts by an auditor to be appointed by the Board of Trade. It further contained power for the Companies supplying the City to amalgamate their undertakings, and also to amalgamate with their own the undertakings of other Companies outside the City; the object being to reduce the expenses of management.

In the year 1869 the Imperial and the South Metropolitan Companies, which were then seeking power to raise further capital, obtained it upon their accepting the same conditions of public control as were prescribed in the City of London Gas Act of 1868; the only variations being that the lighting power of the gas of the Imperial and South Metropolitan Companies was fixed at 14 instead of 16 candles, and that the price in the case of the South Metropolitan Company was fixed at 3s. 6d. instead of 3s. 9d. per 1000 cubic feet, in consequence of that Company having a much smaller capital in proportion to its area of supply. The conditions imposed upon the Companies by the Acts of 1868-9 were, it will be seen, more favourable to the consumers than those of the Act of 1860, while at the same time perfect fairness was shown to the Companies. Indeed it soon became manifest that they had the best of the bargain.

For two or three years after the passing of the new Acts, the prices specified in them were not exceeded. In the years 1872-3, however, there was a considerable rise in the price of coal; and The Gaslight and Coke Company, which appeared to be the first to be seriously affected by the rise in price, and which had, under the powers given to it by the Act of 1868, absorbed the undertakings of four or five of the other London Gas Companies, at once determined that the burden should fall on the gas consumers, and no part of it upon the shareholders. Accordingly, in January, 1873, the Company applied to the Board of Trade for authority, under the City of London Gas Act, 1868, to increase the price of gas from 3s. 9d. to 4s. 9d. per 1000 cubic feet. Commissioners were appointed to inquire into the matter, and they, having heard the Company on the one side, and the Board and the City Corporation on the other, fixed 4s. 4d. as the price of common gas for the year 1873 (being an increase of 7d. per 1000 cubic feet), and allowed a proportionate increase in the price of cannel gas. In January, 1874, the same Company came forward with a proposal for a further advance of price to 5s. 2d.; and an investigation before the same Commissioners resulted in the price being fixed for the year 1874, at 5s. per 1000 cubic feet; being an advance of 8d. on the price of the previous year, and on that of the year 1872 an advance of 1s. 3d., or 33 per cent. above the price named in the Act of Parliament. The Imperial Gas Company also asked for an increase of price in the year 1874, and was authorized, after an inquiry by the same three Commissioners, to charge 4s. 8d. per 1000 cubic feet for that year; being an advance of 11d. on the previous price.

The dissatisfaction of the public with these proceedings of the two large Companies was very great. The Companies had been for years in the enjoyment of the maximum rate of dividend allowed by Parliament—in most cases 10 per cent.; and it was not contemplated that they would, as soon as a diminution of profit appeared imminent, transfer the whole of the disadvantage to the consumer, and advance the price of gas to such an extent as to secure a continuance of dividends at the maximum rate. And here it may be said that the Board was at a great disadvantage in arguing before the Commissioners against the Companies' claims. It was authorized by statute to appear on behalf of the public, but it could only deal with the matter from the outside, having no authority to inspect the Companies' works and processes, for the purpose of ascertaining whether and in what respects there had been an absence of the care and prudence which the Companies were bound to exercise. When, moreover, there seemed reason to believe that there had been wasteful expenditure of capital on new works, and that money had been borrowed at rates of interest needlessly high, it was ruled that the Commissioners could not inquire into the mode in which capital had been raised and expended, and that they must assume, for the purpose of the inquiry, that the whole of the money had been duly raised.

It seemed so radically wrong that Companies having a monopoly of the supply of an article of general consumption should be legally empowered to require their customers to make good whatever loss or reduction of profits might result from adverse circumstances of trade, that the Board resolved to bring the whole question again under the notice of the Legislature. The City Corporation being quite of the same mind with the Board in this matter, the two bodies resolved to act together. Three Bills were prepared—(1) to authorize the purchase of the Companies' undertakings; (2) to enable the two bodies to supply gas independently of the Companies; (3) to place the Companies under further restrictions. In considering what should be the provisions of the third Bill, the Board and the Corporation took into account what the experience of many years had shown—that, so long as high dividends were positively assured to the shareholders of the Gas Companies, there was no security for due care and prudence in the management of the undertakings. The only way of ensuring economy appeared to be to subject the shareholders to a reduction of dividend when the price of gas was increased; and thus to give the Companies the powerful motive of self-interest to carry on their business as prudently and economically as possible. The third Bill accordingly provided that, starting with an initial price at which the Companies might fairly be expected in ordinary circumstances to supply gas of good quality and to make profits sufficient for their prescribed rates of dividend, any increase of such initial price should be accompanied by a corresponding reduction of the rate of dividend. The initial price proposed was that fixed in the City of London Gas Act, 1868—viz., 3s. 9d. per 1000 cubic feet; the illuminating power and other conditions being left for the most part as prescribed by that Act.

The Bills relating to the acquisition of the Gas Companies' undertakings and the establishment of an independent supply, although laid before Parliament, were withdrawn early in the session of 1875, as the general opinion appeared to be that if the Companies were subjected to improved regulations, the supply of gas might be left in their hands. The Bill for regulating the Companies was read a second time and referred to a Select Committee, of which the Right Hon. W. E. Forster was Chairman. All the London Gas Companies appeared before the Select Committee in opposition to the Bill. One of the Companies, however (the Commercial), subsequently adopted the provisions of the measure in a Bill of its own; and the Engineer of another Company (the South Metropolitan) gave evidence in favour of the main provision—that relating to the sliding scale of price and dividend. It was clear, therefore, that the Companies were by no means unanimous in their opposition. The Select Committee having expressed the opinion that, if an increase of price were to be accompanied by a diminution of dividend, there should be a corresponding increase of dividend when the price was reduced, and the Board and the Corporation having expressed their willingness to agree to this, the Select Committee eventually declared the preamble of the Bill proved; and, after a long and careful investigation, which lasted 20 days, the Bill was reported to the House. It was, however, found impossible to pass the Bill through its remaining stages that year; and it was withdrawn on a promise being made by the Government that, if the Bill were introduced in the following year in the amended form in which it left the Select Committee, the Government would not require a further investigation by a Select Committee, but would regard the inquiry already made as sufficient.

In the following year The Gaslight and Coke and Imperial Companies came to an agreement, subject to the sanction of the Board of Trade under the Act of 1868, to amalgamate their undertakings, which were the largest in London, and with them that of the Independent Gas Company. As they at the same time expressed their willingness to adopt the provisions of the Bill approved by the Select Committee in 1875, and also consented that the new share capital should be sold by auction or by public tender, the Board agreed to the amalgamation; and an Act was passed embodying these conditions, and enabling the United Company to raise the capital it required. The South Metropolitan Gas Company also accepted the same conditions, with the exception that the initial price was in its case fixed at 3s. 6d. instead of 3s. 9d. per 1000 cubic feet; and the conditions were incorporated in a Bill which the Company had before Parliament that year. The operations of this Company now extend over the greater part of London south of the Thames; the business of several of the previously existing Companies having since the Act of 1876 been absorbed by it. And here it may be said that, as the result of the amalgamations which have taken place since the City of London Gas Act, 1868, the whole of London, with the exception of some of the further suburbs, is now supplied with gas by three Companies—The Gaslight and Coke, the Commercial, and the South Metropolitan. These three Companies represent the 13 dealt with by the Metropolis Gas Act, 1860.

The Board also availed itself of an opportunity of obtaining improved conditions for the consumers of gas in one of the Suburban Companies' districts. In the year 1880 the Wandsworth and Putney Gas Company applied to Parliament for power to raise more money; and the Board, after petitioning against the Bill, induced the Company to accept the sliding scale of price and dividend, and the condition that the new capital should be raised by auction or public tender. The standard or initial price was fixed at 4s. per 1000 cubic feet and; the standard rate of dividend at 7 per cent.

That the policy enunciated by the Board in the year 1875, and adopted by Parliament in 1876, was a sound one, is sufficiently shown by the fact that since that time the price of gas has been gradually diminishing, and the shareholders' dividends gradually increasing, until gas is now being supplied at 2s. 5d. per 1000 cubic feet, and the Companies are paying dividends of at least 13 per cent. It is true that since the passing of the Act above mentioned, the price of coal has fallen to perhaps its lowest point, and also that the Companies have found a market for their residual products much better than they ever before had or than could then have been anticipated. Previous experience, however, warrants the assumption that, if it had not been for the incentive to economy given by the sliding scale, the consumers of gas would, notwithstanding the more favourable conditions under which the business of gas making is now carried on, be paying a higher price than is now charged. It may be thought, and not perhaps unreasonably, that the circumstance of Companies trading under the protection of a monopoly dividing profits at the rate of 13 per cent., while others working under competition are in these times often glad if they can make 5 per cent., shows that the initial or standard price of gas was fixed too high, and that it might well be reduced. It will, no doubt, be open to Parliament in the event of the Companies, or any of them, applying at a future time for further powers of raising capital, or otherwise, to revise the conditions laid down in the Acts of 1875 and 1876, and especially to consider whether the initial or standard price of gas is not too high. This contingency, however, would appear to be somewhat remote, in view of the large powers of raising capital now possessed by the Companies—powers which at present they are far from having exhausted. It is right to add that in the year 1881, when the South Metropolitan Company was before Parliament with a proposal for more capital, the Board did ask that the initial price should be reduced. At that time, however, there was not the same strong case for it as now; and Parliament was not then disposed to disturb the arrangement.

In the year 1883, The Gaslight and Coke Company took the unexpected step of proposing an amalgamation with the South Metropolitan Company; thus endeavouring to bring into its own hands the gas supply of nearly the whole of London. This step was unlooked for, because, in all the proceedings in Parliament with respect to the Metropolitan Gas Companies, it had never been contemplated that the policy of amalgamation should be carried so far as to make the whole of London dependent for its supply of gas upon one gigantic undertaking. The effect of the amalgamation would have been to get rid of the initial price of 3s. 6d. per 1000 cubic feet, fixed by the South Metropolitan Company's Act of 1876, and applying to nearly the whole of London on the south side of the Thames, and to substitute for it the 3s. 9d. initial price of The Gaslight and Coke Company. This

alone should have been sufficient to prevent the amalgamation without express legislative sanction. The Board found, however, that, in addition to this primary objection, the terms of the proposed union conflicted with several other enactments which were of considerable public value. It therefore made strong representations to the Board of Trade against the union of the two Companies, and especially pointed out that it could not be effected without an Act of Parliament. It may be added that the Local Authorities of almost every part of London were unanimous in opposition to the scheme; and the Board of Trade came to the conclusion that it was one which should not be allowed.

The gas supplied by The Gaslight and Coke, Commercial, and South Metropolitan Companies is tested daily by gas examiners appointed by the Board, at places and with apparatus prescribed by the Gas Referees, who are appointed for that purpose by the Board of Trade. [The testing-places under the Board's jurisdiction are then enumerated; it being noted that two additional stations, one at Hornsey and another at Plumstead, were brought into operation for the first time last year—the former on the 7th of August, and the latter on the 12th of November. The standard illuminating power and purity of the gas are likewise specified; and the penal consequences entailed upon the Companies in the event of failure on their part to reach them, as well as the process to be adopted before conviction, are explained. It is admitted that the occasions on which, when the gas has been defective, the Chief Gas Examiner has been able to certify that it was unavoidable, have formed a considerable proportion of the total number.] In past years several forfeitures have been imposed upon the Companies at the instance of the Board. In the year just ended there has only been one, and that of trifling amount, to which The Gaslight and Coke Company was subjected in March last for defective lighting power. There have been other occasions on which the quality of the gas has been slightly defective; but these have been, comparatively speaking, so rare, and the defects so small, that the Board has not thought proper to take proceedings against the Companies in respect of them. With regard to defective lighting power, it is to be noted that a company is not liable to any forfeiture unless the defect amounts to half a candle. This, of course, is a reasonable provision.

The foregoing remarks apply to the gas tested at the official testing-places; tests made anywhere else having no legal validity. It is necessary, however, to mention that the Board having within the last few years had reason to believe that, in some localities remote from any official testing-place, the gas did not give as much light as it ought, has had the lighting power in several of such localities tested by one of the official gas examiners with a portable photometer. The reliable information thus obtained has, the Board regrets to say, not been satisfactory. The gas has frequently been found to be of less than the prescribed lighting power by as much as one or two candles. The examinations made, however, not being valid according to law, the defaulting Company (which, it may be said, is generally The Gaslight and Coke Company) is free from penal consequences in respect of the defects revealed. The Board some time ago suggested to the Board of Trade that steps should be taken to legalize tests made by the portable photometer; but no action has been taken by that department. It is evident that the controlling authority ought to have some further power in this matter; for, as things stand, many consumers of gas do not get what the Companies are bound by statute to give them, and the Companies may be delinquents to any extent without incurring a forfeiture.

The question of the photometric standard has been for some time under the consideration of persons interested in it; and all who have studied the subject have come to the conclusion that the standard now in use—the sperm candle—is untrustworthy on account of its liability to variation. In the years 1886 and 1887 a long series of careful and complete experiments were made by the officers of the Board under the Board's authority, with the result that the pentane air-gas standard, as devised by Mr. A. Vernon Harcourt, one of the Gas Referees, appeared to possess, in a higher degree than any other, the merits of simplicity, accuracy, and reliability. The Board itself has not formally expressed any opinion on the subject; but the recorded results of the experiments made by the Board's officers will be of value when the question of adopting a better standard is taken up by the Board of Trade.

[This chapter of the report concludes with a brief reference to the power to appoint inspectors of gas-meters in the Metropolis (except the City), conferred on the Board by the Metropolis Gas Act Amendment Act, 1861. The Board have three testing-places—one situated in St. Anne Street, Westminster; one in White Lion Street, Spitalfields; and one in Southwark Street. At each of these places there is an inspector, with a staff of assistants, who tests all meters brought to him for the purpose; a small charge being made for each, according to a fixed scale. The number of meters tested last year was 73,080; the fees received or receivable in respect thereof amounting to £2670 2s. 6d.]

As closely bearing on the matters above recorded, it may be of interest to give an account of the Board's proceedings in regard to electric lighting. In the year 1878, when public attention was being turned to the question of lighting by electricity, the Board thought it desirable that there should be a practical test in London of the applicability of the light to street illumination, and that the local authorities and the people generally should have an opportunity of judging of its effects. It appeared to them that no thoroughfare was better suited for a trial of the electric light than the Victoria Embankment; and it seemed, moreover, the proper thing that the experiment should be made by the Board, as the central municipal authority. An arrangement was accordingly made with a French Company which had been lighting one of the principal thoroughfares in Paris during the International Exhibition of that year, according to a method devised by M. Jablochkoff. The Company undertook to supply a 20-light electric battery, with 20 lamps and other appliances; the Board, on its part, undertaking to furnish the motive power, and to pay for the wires and other materials, and the expense of laying and fixing them. The 20 lamps were fixed on the ornamental lamp standards on the parapet of the Embankment between Westminster and Waterloo Bridges, every alternate standard being fitted with a lamp; and they were first lighted in the month of December, 1878. After a time, it was ascertained that the machinery in use would supply sufficient motive power for a much larger number of lights, and that there would be no difficulty in lighting the whole Embankment. Accordingly, 20 more lamps were erected on the parapet wall between Waterloo and Blackfriars Bridges; and the whole 40 lamps were lighted on May 10, 1879—thus illuminating the whole length of the Embankment. The number of lights was further increased to 50 in the following October; the 10 additional lamps being placed on Waterloo Bridge, and the power being supplied by the same engine. The power would, indeed, it was found, have been sufficient for 60 lamps; but there was no adjacent thoroughfare which the Board had authority to light, and where the other 10 lamps could be placed. After the first arrangement had been in existence for some months, the Company took upon themselves the whole of the responsibilities, and charged for the lighting at the rate of 5d. per lamp per hour. At the end of a further period of three months, the price was reduced to 3d. per lamp per hour; and six months later (in April, 1880), the Company agreed to continue the light for one year at the rate of 2½d. per lamp per hour. In June, 1881, a new agreement was made with the Company to continue the lights for a term of three years from that date, and to reduce the price from 2½d. to 1½d. The light was very brilliant; and the only fault to be found with it was a want of steadiness and reliability. The Board had several times to complain of the sudden extinction of many of the lights during the hours when the Company was by agreement bound to keep them shining. This, of course, was a serious defect in an arrangement for lighting a public thoroughfare in a large city. The agreement with the Company came to an end on June 30, 1884; and as their affairs were then in liquidation, and as, moreover, there seemed, at the time, no prospect of the Company being able to remedy the defect above mentioned, the Board resolved not to renew the agreement. Subsequently the Board publicly invited tenders from persons willing to undertake what had hitherto been entrusted to the Jablochkoff Company; and a small number of tenders were received. None of them, however, offered terms which the Board considered satisfactory; and it was therefore decided to revert to gaslight until some more certain and suitable method of lighting by electricity should be suggested. The Board have not since deemed it advisable to repeat their experiments with the new illuminant.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, *Saturday.*

Mr. William Foulis, the Chief Engineer of the Glasgow Corporation Gas-Works, has prepared his report on the proposed alterations of the Arbroath Gas-Works. The Arbroath Gas Corporation last summer obtained a report on the subject from Mr. R. Mitchell, Engineer of the Edinburgh Gas-Works, in which Mr. Mitchell tendered the advice that new works should not be erected, but that the present works should be improved by the construction of a new gasholder, the extension of the purifiers, the laying of a new main for the lower district of the town, and that the governor for the lower district main should be coupled up to both holders. These recommendations were acceptable to the Committee who had charge of the question. Among the members of the Corporation, however, there was a large party who favoured the removal of the works to a new site; and after a good deal of discussion, these were able to carry their point to the extent of having the question referred to Mr. Foulis. The report which he has prepared should show them the folly of their opposition. He declares against the removal of the works; and the wording of the motion appointing him requires that the opposition shall now accept his recommendations. On the question of extension, Mr. Foulis agrees in effect with the Committee, and with Mr. Mitchell, particularly on the necessity for increasing the storeage accommodation. The text of his report has not been published yet; but it may be expected that the work of extension will now go on.

The Engineers' reports to the Edinburgh and Leith Gas Commission on Monday show that during January the output of gas from the Edinburgh works was 115,230,000 cubic feet—an increase of 680,000 cubic feet on the output in January of last year. The output from the Leith works was 50,982,000 cubic feet—an increase of 207,000 feet. The benefit of Mr. Mitchell's improved system of retort-setting is seen in this—that, although producing a much larger quantity of gas, the number of retorts in use was only 477, as compared with 481 in January of last year. The Treasurer's report for the month to the 8th inst., shows the revenue to have been £34,255; making a total received since Aug. 1, of £94,334.

A question about the assessment of business premises for water-rates was decided by Lord Kinnear in the Court of Session to-day. The Bank of Scotland owns one of the finest commercial buildings in Edinburgh, valued at £1700. It is divided into three portions—the bank proper, the house of the cashier above the bank, and the house of the principal messenger below. There is no internal communication between the messenger's house and the bank; but there is a door between the bank and the house of the cashier. In respect of this entrance, which is constantly used, the Water Trustees imposed the full domestic water-rate of 7½d. per £1 upon the gross value—the sum due amounting to £53 2s. 6d. The Directors of the bank resisted payment, and submitted that they were liable only for the value of the portions occupied by the cashier and messenger, or under the Edinburgh and District Water Acts, 1869 and 1874, on a sum not exceeding £120. A charge to pay was served by the Trustees; and then the Bank brought an action in the Bill Chamber to suspend the charge. His Lordship decided that the internal communication between the Bank and the cashier's house satisfied the provisions of the statutes upon that point; and he refused the suspension, with costs. The action was a test one; and its effect will be, in all cases where a superior officer resides on the premises in apartments which communicate directly with the office—and this is nearly always the case, being in fact the reason for having the officer there—the whole building will be assessed for the domestic water-rate. The decision, if sustained on appeal, will bring large additional revenue to the Water Trust.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, *Saturday.*

There are about 28,700 lights in the closes and common stairs in Glasgow, all under the control of the Watching and Lighting Department of the Town Council. Each of these lights consumes, on an average, rather more than 2600 feet of gas per annum; so that the total annual consumption of gas under this head may be put down at 75 million cubic feet. Lights of the kind referred to are increasing in number at an enormous rate per annum. This is also true of the ordinary street lighting—indeed, so great is the increase in both branches of the public lighting that the consumption of gas is from four to five million cubic feet greater each succeeding year. Of course, the extent to which there is any increase in the amount of gas consumed for public lighting depends largely upon the price of gas for the time being. If 2d. per 1000 feet be taken off the price, that is a benefit to the Lighting Department of about £1500 per annum; and the practice is to give the lighting the entire benefit. Over the whole city—streets, bridges, courts, &c.—there are at present about 41,500 public lamps in use.

The proposal to get an additional photometer for use in testing the quality of the gas away from the gas-works was again brought up at the last meeting of the Port-Glasgow Town Council. There is already a jet photometer in the possession of the gas authorities of the town. It was formerly in use in the Town Buildings when the Manager's office was there; but it is now in the Manager's house at the gas-works. This is now to be removed to the Police Office, and the Manager is to be provided with a common pressure-gauge instead. I understand that negotiations have been opened with Mr. R. R. Tatlock, Gas Examiner for Glasgow, to undertake the gas testing at Port Glasgow.

The demand for sulphate of ammonia has been rather slack this week; and the spot quotations have dropped to £12 per ton, at which a number of transactions took place.

The Glasgow pig-iron warrant market has manifested great strength

this week; each day witnessing an advance in the cash price. Buying has been steadily increased; but, so far, the general outside public are doing hardly anything. It is said that the "bears" have covered in pretty well; but there is room for a little doubt on that point. When those who are undersold take alarm, there will be a much sharper rise than has yet been seen. Makers report that they have done a very large amount of business with merchants this week; the buying being for consumption, and, without exception, they have advanced their quotations generally to the extent of 1s. per ton. Scotch warrant iron touched 42s. 9d. per ton cash yesterday.

On the whole, business in the local coal trade has scarcely been so good this week. Prices, however, are well maintained all round.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Feb.* 23.

Sulphate of Ammonia.—There is a somewhat weaker feeling, which, however, can hardly excite wonder, seeing that it is fostered in every possible way by the "bear" operators; and while the *bonâ fide* demand from consumers does not improve, the market will not readily recover its steady tone. Much, of course, depends upon the extent of the sales for March delivery by the speculators; as by their own necessities they may be debarred from making havoc of the market. Certainly the way in which spot parcels have been picked up even this week indicates requirements which may be larger than the most sanguine producer may anticipate to-day. And as every week brings us so much nearer the period of the principal consumption, greater activity should presently prevail. But the chances of improvement will be defeated if makers should attempt to press spot parcels on the market. There are apparently now sellers—both first and second hand—at £12 2s. 6d. to £12 1s. 3d. at the ports. Nitrate, in spite of heavy arrivals, keeps very steady.

LONDON, *Feb.* 23.

Tar Products.—With the exception of creosote oil, pitch, and carbolic, tar products generally are suffering from unusual lassitude. Buyers are holding off, and declare that their stocks are large. There has not been such inactivity in this market for some time. There are marked indications that the products will see considerably lower prices before long. Distillers had, therefore, better beware of high-priced tar. Prices:—Tar, according to position, 18s. to 23s. per ton. Benzole (nominal), 90 per cent., 8s. per gallon; 50 per cent., 2s. 3d. Toluol, 1s. 5d. per gallon. Solvent naphtha, 1s. 2d. per gallon. Crude naphtha, 30 per cent., 1s. per gallon. Light oil, 3d. per gallon. Creosote, 2d. per gallon. Pitch, 21s. per ton. Carbolic acid (crude), 3s. 9d. per gallon. Cresylic acid, 11d. per gallon. Tar salts, 15s. per ton. Anthracene (nominal), 30 per cent., "A" quality, 1s. 4d. per unit; "B" quality, 1s. 2d.

Ammonia Products.—Sulphate of ammonia is, at the moment, somewhat unsaleable; and considerable efforts are being made to "bear" this market for spring delivery. Having, however, regard to the home and increased consumption during the next four months, makers would be unwise to contract at prices now offering. Business has been done in sulphate during the week at prices ranging from £12 to £12 5s. per ton. Prices of other products: Gas liquor (5° Twaddel) 8s. per ton, with a rise or fall of 1s. 6d. per degree. Liquor ammonia, 2d. per lb. Carbonate of ammonia, 3½d per lb. Muriate of ammonia, brown, £20 per ton; white, £26 10s. Sal-ammoniac, £32 per ton.

THE WELLS TOWN COUNCIL AND THE WATER-WORKS.—At a special meeting of the Wells Town Council held on Monday last week, it was decided to accept the offer of the Wells Water Company, made on the 18th ult., to sell their undertaking to the Corporation for £15,000, subject to the approval of the Local Government Board.

EXTENSIONS AT THE LLANELLY GAS-WORKS.—The general extension of the Llanelly Gas-Works, which was commenced two years ago by putting down new exhausters, boilers, and purifiers, was last year proceeded with by the addition of four benches of retorts with regenerative furnaces, and now to be further extended by the telescoping of a 90-feet holder, the removal of an old 60-feet holder, and the erection of a new telescopic one of this diameter. All these extensions are being carried out by Messrs. R. and J. Dempster, of Newton Heath, Manchester, according to the designs of Mr. A. G. Browning, the Company's Engineer.

LOCAL GOVERNMENT BOARD INQUIRY AT CLECKHEATON.—Last Wednesday, Mr. Arnold Taylor held an inquiry at Cleckheaton, on behalf of the Local Government Board, relative to an application made by the Local Board for sanction to borrow the sum of £12,000 for gas-works purposes, £2300 for works of sewerage, and £4000 for providing public baths. With regard to the amount required for additional gas plant, the intention of the Board is to construct a new tank and gasholder only at present; this being a portionof a scheme they have in hand for the erection, by degrees, of new works on a site they have acquired alongside the railway.

THE NORTHERN COAL TRADE.—There is a slight easiness in the coal trade of the North this week, and one or two of the collieries have had rather a broken time in consequence of the non-arrival of steamers, which had been detained by storms. Steam coal, however, has been sold at 10s. 6d. per ton f.o.b. in the Tyne; so that it will be noticed that there is no fall in prices. Small coal is fairly plentiful, and sells at from 2s. 6d. to 3s., according to the position of the collieries. For gas coal the local demand shows a slight falling off; but there is more activity in the export enquiry. Sales have been made at 8s. per ton f.o.b.; and in other cases 7s. 6d. per ton has been refused by the colliery owners. A contract has been entered into for the supply of gas coal to Stockholm at a price which leaves about 7s. per ton to the coalowner for the coal put on board. The quantity is from 20,000 tons to 30,000 tons; and the price is about 2s. per ton above that of last year. Coke is very steady; and for gas coke there is a large and growing demand at better prices.

INCREASED RATING OF THE SOUTH METROPOLITAN GAS COMPANY'S MAINS.—An appeal against an increase in the assessment of the South Metropolitan Gas Company's property in the Greenwich Union recently came before the General Assessment Sessions. Owing to the laying of the new main from the Company's works at East Greenwich to the Old Kent Road, the assessment had been raised by £1337 for the portion of the main in the Greenwich division, by £317 for that in the Kent part of the Deptford division, and by £100 for that in the Surrey part of the same division of the Union. It was contended, on behalf of the Company, that the value of the undertaking had not been increased by the section of the main in the Greenwich division. It was urged, on the other hand, that the rule applicable to the rating of unproductive hereditaments—viz., a charge of 5 per cent. on the structural value—should be applied. Eventually the assessment was increased by £500 only. The other two cases being for small amounts, the Company did not contest the matter; and the assessments were therefore raised by £317 and £100 respectively.

WINDING UP OF THE PAIGNTON WATER COMPANY.—In the Chancery Division of the High Court of Justice last Saturday, before Mr. Justice North, a petition was presented by the above-named Company for compulsory winding up. Mr. Chadwyck Healey, who appeared in support of the petition, said the Company was an unregistered one, and an order was asked so that it might dissolve itself. The undertaking had, with the consent of the Local Government Board, been sold to the Local Authority of Paignton for £10,500, and nothing now remained to be done except to divide the purchase money. The Company was incorporated in 1867, under a Special Act of Parliament, to supply the town with water. They had divided £6580 among the shareholders in repayment of the subscribed capital; and they had a balance of £4200 in hand. The debts did not amount to £500. His Lordship made the usual order for winding up.

EXTENSION OF THE WIGAN CORPORATION WATER-WORKS UNDERTAKING.—Some necessary additions to the Wigan Corporation water undertaking have just been completed; and by their means the higher parts of the district of supply will be more efficiently provided with water than has hitherto been the case. A water-tower has been erected by the service reservoir at Thornhill. This tower is 30 feet higher than the top water in the service reservoir; and the Corporation are thus enabled to supply houses situated too high to draw their supply from the main pipes. The water is pumped by means of one of Bailey's engines; and a separate rising main has been laid from the pumping station to the newly-erected tower. At Worthington two additional service reservoirs have been constructed, on the site of what was intended as the bed of the original reservoir. But the coal mines underneath gave too much trouble; the bed was found to be a veritable riddle; and another scheme had to be carried out. An embankment was thrown up across the valley; and the northern-most portion was afterwards abandoned. Since the completion of the first reservoir, another has been added. During the late dry weather the Corporation Water Committee have looked about to see if they could not add to their storeage capacity, and turned their attention to the once discarded portion of the valley. The mines have long since ceased to be worked; and from the water which had gathered on the surface, it was evident that the subterranean caverns had quite as much as they required, or were likely to want till the colliery workings were once more opened. But the difficulty was that the outlet from this part into the river was considerably lower than the goit to the present reservoirs. The extra reservoirs were raised to the level of the outlet; and a small pumping station was built on the margin of the lake, in order to lift the water into the goit, which runs at the top of the valley into the first reservoir.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For STOCK MARKET INTELLIGENCE, see *ante*, p. 381.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d
590,000	10	12 Oct.	10½	Alliance & Dublin 10 p. c.	10	18¼–19½	..	5 7 8
100,000	10	„	7½	Do. 7 p. c.	10	13–14	..	5 7 2
800,000	100	2 Jan.	5	Australian (Sydney) 5% Deb.	100	110–112	..	4 9 3
100,000	20	29 Nov.	10	Bahia, Limited	20	24–26	..	7 13 10
200,000	5	14 Nov.	7½	Bombay, Limited	5	6¾–7¼	..	5 3 5
40,000	5	„	7½	Do. New	4	5¾–5¾	..	5 4 2
380,000	Stck.	14 Feb.	11½	Brentford Consolidated	100	226–226*	..	5 3 1
125,000	„	„	8½	Do. New	100	168–168*	..	5 4 3
220,000	20	13 Sept.	10½	Brighton & Hove, Original	20	43–45	..	4 13 4
330,000	20	28 Sept.	11½	British	20	46–48	+1	4 13 9
50,000	10	13 Sept.	11	Bromley, Ordinary 10 p. c.	10	20–22	..	5 0 0
39,000	10	„	8	Do. 7 p. c.	10	13½–14½	..	5 10 4
328,750	10	14 Nov.	8	Buenos Ayres (New) Limited	10	13½–14½	..	5 10 4
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	107–110	..	5 9 1
150,000	20	10 Aug.	7	Cagliari, Limited	20	26–28	..	5 0 0
550,000	Stck.	12 Oct.	13½	Commercial, Old Stock	100	267–272	+2	5 1 1
130,000	„	„	10½	Do. New do.	100	215–220	+1	4 17 9
180,000	„	28 Dec.	4½	Do. 4½ p. c. Deb. do.	100	123–128	..	3 10 8
557,320	20	13 Dec.	15	Continental Union, Limited	20	48–50	..	5 4 0
242,680	20	„	13	Do. New '69 & '72	14	34–36	..	5 1 0
200,000	20	„	10	Do. 7 p. c. Pref.	20	38–40	..	5 0 0
75,000	Stck.	28 Sept.	10	Crystal Palace District	100	205–215	..	4 18 0
234,060	10	30 Jan.	13	European, Limited	10	25½–26½	..	4 18 1
120,000	10	„	13	Do. New.	7½	18–19	..	5 2 7
354,060	10	„	13	Do. do.	5	12–13	..	5 0 0
5,468,600	Stck.	14 Feb.	13	Gaslight & Coke, A, Ordinary	100	255–259*	−2	5 0 5
100,000	„	„	4	Do. B, 4 p. c. max.	100	99–104*	..	3 16 11
665,000	„	„	10	Do. C, D, & E, 10 p.c.Pf.	100	260–265*	..	3 15 6
80,000	„	„	5	Do F, 5 p. c. Prf.	100	123–128*	..	3 18 1
60,000	„	„	7½	Do. G, 7½ p. c. do.	100	180–185*	..	4 1 1
1,800,000	„	„	7	Do. H, 7 p. c. max.	100	170–175*	..	4 0 0
463,000	„	„	10	Do. J, 10 p. c. Prf.	100	258–263*	..	3 16 1
1,051,150	„	13 Dec.	4	Do. 4 p. c. Deb. Stk.	100	120–123	..	3 5 0
294,850	„	„	4½	Do. 4½ p. c. do.	100	125–130	..	3 9 3
650,000	„	„	6	Do. 6 p. c. do.	100	174–179	..	3 7 0
8,600,000	Stck.	14 Nov.	10	Imperial Continental	100	210–214	..	4 13 5
75,000	5	13 Dec.	6	Malta & Mediterranean, Ltd	5	5–5¼	..	5 9 1
560,000	100	1 Oct.	5	Met.of Melbourne,5 p.c. Deb.	100	115–117	..	4 5 6
641,920	20	29 Nov.	6	Monte Video, Limited	20	19–20	..	6 0 0
150,000	5	29 Nov.	10	Oriental, Limited	5	9¼–9¾	..	5 2 7
60,000	5	28 Sept.	7	Ottoman, Limited	5	6–7	..	5 0 0
166,870	10	16 Jan.	4	Paris, Limited	10	5¾–6	..	6 13 4
				People's Gas of Chicago—				
420,000	100	2 Nov.	6	1st Mtg. Bds.	100	104–107	..	5 12 1
500,000	100	1 Dec.	6	2nd Do.	100	95–100	..	6 0 0
100,000	10	13 Oct.	10	San Paulo, Limited	10	15¾–16¼	..	6 1 2
500,000	Stck.	29 Aug.	16½†	South Metropolitan, A Stock	100	323–328	..	4 19 1
1,850,000	„	„	12½†	Do. B do.	100	246–251	..	4 16 7
141,500	„	„	13½†	Do. C do.	100	260–270	..	4 18 1
600,000	„	28 Dec.	5	Do. 5 p. c. Deb. Stk.	100	137–140	..	3 11 5
60,000	5	29 Aug.	11	Tottenham & Edm'ntn, Orig.	5	11–13	..	4 4 0
				WATER COMPANIES.				
717,467	Stck.	28 Dec.	9	Chelsea, Ordinary	100	259–264	..	3 8 2
1,720,560	Stck.	12 Oct.	7	East London, Ordinary	100	209–212	+2	3 6 0
700,000	50	13 Dec.	9	Grand Junction.	50	129–136	..	3 11 5
708,000	Stck.	14 Feb.	10½	Kent	100	272–277*	..	3 15 9
1,048,800	100	28 Dec.	9	Lambeth, 10 p. c. max.	100	254–259	..	3 9 6
406,300	100	„	7½	Do. 7½ p. c. max.	100	197–202	..	3 14 2
200,000	Stck.	28 Sept.	4	Do. 4 p. c. Deb. Stk.	100	118–122	..	3 5 7
500,000	100	14 Feb.	12½	New River, New Shares	100	350–360*	..	3 7 4
1,000,000	Stck.	30 Jan.	4	Do. 4 p. c. Deb. Stk.	100	123–126	..	3 3 6
902,300	Stck.	13 Dec.	6	S'thwk & V'xhall, 10 p.c.max.	100	167–173	..	3 9 9
126,500	100	„	6	Do. 7½ p. c. do.	100	161–166	..	3 12 3
1,155,068	Stck.	„	10	West Middlesex	100	265–270	..	3 14 1

*Ex div

† Next dividend will be at this rate.

GWYNNE & CO., ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS & ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 2698.

Exhausters of nearly all sizes in Stock.

Prize Medals at all the Great International Exhibitions.

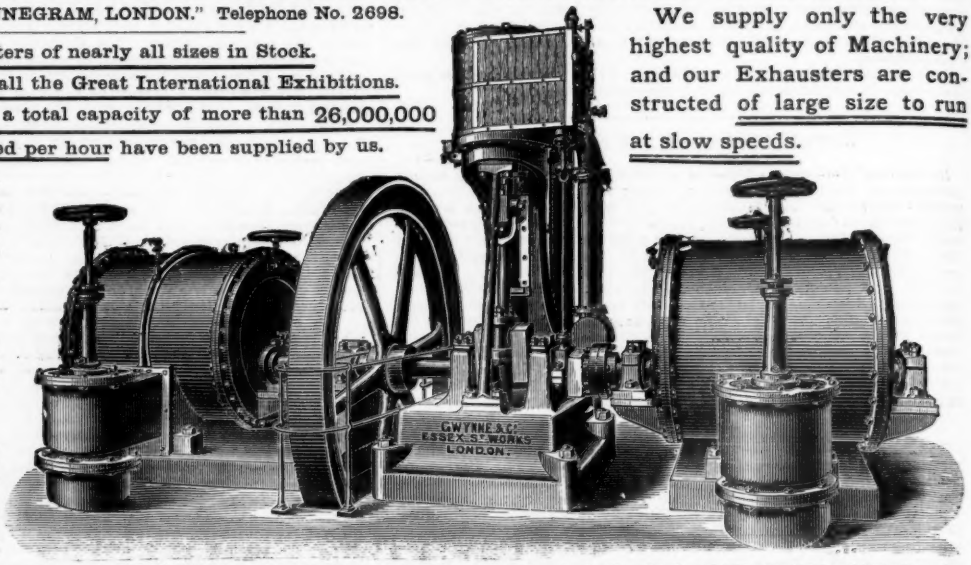
Exhausters equal to a total capacity of more than 26,000,000 cubic feet passed per hour have been supplied by us.

Our new Patent Non-Fluctuating Exhausters, to work without the slightest oscillation or variation in pressure, are strongly recommended.

MAKERS OF EVERY DESCRIPTION OF HYDRAULIC AND GAS MACHINERY.

Gwynne & Co.'s New Catalogue and List of Testimonials can now be obtained on application.

We supply only the very highest quality of Machinery; and our Exhausters are constructed of large size to run at slow speeds.



Exhausters and Vertical Engine as supplied for both the Fulham and Bromley-by-Bow Stations of The Gaslight and Coke Company.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

ANDREW STEPHENSON, Agent for the GAS PURIFICATION AND CHEMICAL COMPANY, Limited, Palmerston Buildings, Old Broad Street, LONDON, E.C.

CANNEL COAL, &c.

JOHN ROMANS & SON, EDINBURGH.
Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.

Prices, &c., will be forwarded on application to No. 30, ST. ANDREW SQUARE, EDINBURGH, / No. 54, BERNARD STREET, LEITH, } SCOTLAND.

THE GAS INSTITUTE.

THE Council respectfully request that all SUBSCRIPTIONS and COMMUNICATIONS relative to THE GAS INSTITUTE be addressed to Mr. William Longworth, Gas Offices, Guildford, who has been appointed Honorary Secretary, *pro tem.*
Dec. 29, 1888.

WANTED, by a Total Abstainer, a Situation in a Gas-Works as WORKING MANAGER or FOREMAN. Has had good practical experience in Carbonizing, Fitting, Main and Service Laying, Reading Meters, and Repairs connected with Gas Plant. Good testimonials. Married.
Address No. 1668, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a total abstainer, a Situa- tion in a small Gas-Works, making from 4 to 8 millions, as WORKING MANAGER or FOREMAN. Has had Six years' experience; carbonizing over 3 millions, Main and Service Laying, Smithing, Reading Meters, and all repairs. Age 36; married.
Address No. 1676, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Situation as practical MANAGER of Tar and Ammonia Works, or to Superintend the Erection of same. No objection to go abroad. Best of references.
Address No. 1679, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Working Foreman Stoker for a Gas-Works in the North Riding of Yorkshire. Annual make, 35 millions. One used to Regenerative Furnaces preferred.
Applications, stating age, qualifications, wages required, and giving references, to be sent to No. 1678, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CHIEF CLERK.

WANTED, by a provincial Gas Com- pany, an experienced person as CHIEF CLERK. An intimate knowledge of the ordinary routine of a Gas-Rental Office, and of Book-keeping by double-entry, indispensable. Commencing salary, £160 per annum.
Applications, stating age, and enclosing copies of testimonials of recent date, to be sent to No. 1675, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C., on or before the 6th of March next.

FOR SALE—5000 to 10,000 gallons of TAR.
Application to be made to the SECRETARY, Gas and Water Company, EAST GRINSTEAD.

TIMMIS & CO., of STOURBRIDGE
Make only the best quality of FIRE-CLAY RETORTS, BRICKS, TILES, & LUMPS. Also SPECIAL SILICA BRICKS, to stand great heats. All descriptions kept in Stock.
For Prices apply to JAMES LAWRIE AND Co, 63, Old Broad Street, E.C., Sole Agents for London and District. Telegraphic Address: "EIRWAL, LONDON."

ALEX. WRIGHT & Co., 55, 55a, and 56, MILLBANK STREET, LONDON, S.W.
[Telegraphic Address: "PRECISION LONDON."]
Makers of Wet and Dry Gas-Meters, Station Meters and Governors, Photometers, and Gas-Testing Apparatus, Test Gasholders and Meters, Registering and other Gauges, &c., &c.
*** See Advertisement on Page III. of the Wrapper of this week's issue.

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON,
Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. 361 of last week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

FOR SALE—A good stout Wrought-Iron OIL-TANK, 7000 gallons, and three Cast-Iron 4-inch SOCKET ROSIN STILL WORMS, with Wrought-Iron Standards and Clips complete. To be immediately cleared for alterations of premises.
Apply to F. MORRIS, Tar and Rosin Distiller, Plough Bridge, Rotherhithe, LONDON, S.E.

CROYDON GAS COMPANY.

IMPORTANT SALE OF SHARES.

MESSRS. HOOKER & WEBB have received instructions to SELL BY AUCTION at the Greyhound Hotel, Croydon, on Thursday, the 14th of March, 1889, at 6 o'clock precisely, in suitable lots
156 FULLY-PAID SHARES IN THE CROYDON GAS COMPANY,
at present paying dividends at the rate of 14 and 11 per cent. per annum.
The high standing of this Company, its excellent management, and with the prospect of increasing dividends, render the Shares a desirable Investment for large or small sums.
Particulars and conditions of Sale may be had at the Greyhound Hotel, and of the AUCTIONEERS, 4, High Street, CROYDON.

YSTRAD GAS AND WATER COMPANY.

TENDERS are requested for the AMMONIACAL LIQUOR produced at the Porth Gas-Works of the above Company; the Liquor to be delivered free into Contractors' Tanks at the Eirw Branch Sidings of the Taff Vale Railway, Hafod.
Particulars on application to F. J. BAYNES, General Manager, 9, Pentre, GLAM.

TENDERS FOR TAR AND LIQUOR.

THE Directors of the Victoria New- market Gaslight and Coke Company, Limited are prepared to receive TENDERS for the surplus TAR and LIQUOR made at their Works during the ensuing Twelve months, ending March 25, 1890.
Tenders, stating price per thousand gallons, delivered free on rails at Newmarket Station, to be sent to the undersigned on or before March 7, 1889.
The Directors do not bind themselves to accept the highest or any tender.
By order,
THOMAS WILKINSON,
Manager and Secretary.
Gas-Works, Newmarket, Feb. 21, 1889.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. Spent Oxide and Sulphate of Ammonia purchased.
120 and 121, NEWGATE STREET, LONDON, E.C.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID for making SULPHATE OF AMMONIA of high quality and colour.
Highest References and all particulars supplied on application.

SHIPPING AND INSURANCE.

ROBERT BRUCE FITZMAURICE, 9, Crosby Square, London, E.C.
Lowest Rates of Freights and Insurance quoted, and Shipments attended to.
Apply as above.

THE Ramsey Gaslight Company, Isle of Man, invite TENDERS for a Cast-Iron SCRUBBER 5 feet diameter and 30 feet high, complete with 8-inch Bye-pass Valves and Connections, and Water Distributor. Delivered and fixed at Works.
They also require a Second-hand PURIFIER, 8-inch Connections, from 7 to 10 feet square.
Tenders to be forwarded on or before the 11th of March.
The lowest not necessarily accepted.

CORPORATION OF LEICESTER.
(AYLESTONE ROAD WORKS.)

CAST-IRON FLOOR-PLATES AND COLUMNS.
SECTION No. 2.—CONTRACT No. 11.

THE Gas Committee of the above Cor- poration are prepared to receive TENDERS for the Manufacture, Delivery, and Erection of CAST-IRON FLOOR-PLATES and COLUMNS.
Drawings may be seen, and specification and form of tender obtained, upon application to the Engineer, and on payment of the sum of £5, which will be returned upon the receipt of a *bonâ fide* tender.
Tenders, addressed to Councillor Lennard, Chairman, and endorsed "Tender for Cast-Iron Floor-Plates and Columns," to be delivered at these Offices not later than Eleven o'clock a.m. on Saturday, March 9 prox.
The Committee do not bind themselves to accept the lowest or any tender.
ALFRED COLSON, C.E.,
Engineer and Manager.
Gas Offices, Millstone Lane,
Leicester, Feb. 14, 1889.

CORPORATION OF LEICESTER.
(AYLESTONE ROAD WORKS.)

ROLLED STEEL JOISTS.
SECTION No. 2.—CONTRACT No. 12.

THE Gas Committee of the above Cor- poration are prepared to receive TENDERS for the Manufacture, Delivery, and Erection of ROLLED STEEL JOISTS.
Drawings may be seen, and specification and form of tender obtained, upon application to the Engineer, and on payment of the sum of £5, which will be returned upon the receipt of a *bonâ fide* tender.
Tenders, addressed to Councillor Lennard, Chairman, and endorsed "Tender for Rolled Steel Joists," to be delivered at these Offices not later than Eleven o'clock a.m. on Saturday, March 9 prox.
The Committee do not bind themselves to accept the lowest or any tender.
ALFRED COLSON, C.E.,
Engineer and Manager.
Gas Offices, Millstone Lane,
Leicester, Feb. 14, 1889.

GASHOLDER AND TANK REQUIRED.

THE Skelmanthorpe Gas Company, Limited, near Huddersfield, invite TENDERS for a GASHOLDER and TANK, with all necessary Columns, Girders, Valves, Inlet and Outlet Pipes, (9-inch), &c., complete. Size of holder: 48 feet diameter; 16 feet deep.

Tenders should be accompanied by detailed plans and specifications, for which no payment will be made.

Tenders to be addressed to the Chairman of the Company not later than the 21st day of March, 1889.

The Company do not bind themselves to accept the lowest or any tender.

By order,
HENRY WADSWORTH, Secretary.

TO GASHOLDER MAKERS.

THE Gas Committee of the Leigh Local Board invite TENDERS for the Construction and Erection of a TELESCOPIC GASHOLDER, 100 feet diameter, and 56 feet deep.

Drawings may be seen and a copy of Specification obtained—on payment of two guineas, which will be returned on receipt of a *bond fide* tender—on application to the undersigned.

Sealed tenders, endorsed "Holder," and addressed to Jas. Thorp, Esq., Chairman, to be delivered at the Town Hall, Leigh, not later than Monday, the 11th of March next.

The lowest or any tender not necessarily accepted,
ALFRED T. FLETCHER,
Engineer and Manager.
Gas-Works, Leigh, Lancs., Feb. 19, 1889.

TO RETORT MAKERS.

THE Gas Committee of the Leigh Local Board invite TENDERS for 76 MACHINE-MADE RETORTS and a quantity of FIRE-BRICKS and CLAY.

Sealed tenders, endorsed "Retorts," and addressed to Jas. Thorp, Esq., Chairman, to be delivered at the Town Hall, Leigh, not later than Monday, the 11th of March next.

The lowest or any tender not necessarily accepted.

Further particulars on application to
ALFRED T. FLETCHER,
Engineer and Manager.
Gas-Works, Leigh, Lancs., Feb. 19, 1889.

SPENT OXIDE OF IRON.

THE Reading Gas Company invite TENDERS, at a price per ton, for about 500 to 600 tons (more or less) of SPENT OXIDE OF IRON (O'Neill's). The lot is ready for immediate delivery, and may be seen, or a small parcel—approximate in quality of the whole lot—will be forwarded.

Payment, cash on delivery.

The Company will undertake to deliver the Oxide into Barges on the River Kennet (alongside the Gas-Works), which is close to, and adjoining the River Thames.

Further particulars may be obtained on application.

Tenders, endorsed "Spent Oxide," to be addressed to the undersigned, on or before the 11th day of March next.

EDWARD BAKER, Engineer and Manager.
Reading Gas-Works, Feb. 18, 1889.

HARTLEPOOL GAS AND WATER COMPANY.

RETORT-FITTINGS, ETC.

THE Directors of the Hartlepool Gas and Water Company are prepared to receive TENDERS for the supply of RETORT-FITTINGS required in the erection of 56 additional Retorts at their West Hartlepool Works.

Plans and specifications may be seen, copies of same obtained, together with any further information, upon application to the Company's Engineer, Mr. Thomas Bower.

Tenders, sealed and endorsed "Tender for Retort-Fittings," to be sent to the undersigned not later than Tuesday, the 12th day of March next.

The Directors do not bind themselves to accept the lowest or any tender.

THOMAS TREWHITT, Secretary.
Hartlepool Gas and Water Company's Offices,
West Hartlepool, Feb. 19, 1889.

CORPORATION OF STOCKPORT.

TO IRONFOUNDERS.

THE Gas Committee are prepared to receive TENDERS for about 220 10-inch Cast-Iron SOCKET AND SPIGOT PIPES, each to be 9 feet long exclusive of Socket, and not to exceed 170 lbs. per lineal yard; also for IRREGULARS.

Deliveries to commence the third week in April.

Tenders, stating price per ton, delivered free at Edgeley or Heaton Norris Stations, to be sent in, under sealed cover, endorsed "Tender for Main Pipes," and addressed to the Chairman of the Gas Committee, before Tuesday, March 5.

The Committee do not bind themselves to accept the lowest or any tender.

Forms of tender and particulars may be obtained on application to the undersigned.

JAMES JACQUES, Engineer and Manager.
Gas-Works, Stockport, Feb. 21, 1889.

THE Widnes Local Board are prepared to receive TENDERS for the following:—
FIRE-CLAY, RETORTS, ETC.
GAS WASHER-SCRUBBER.

Specifications and forms of tender may be obtained from Mr. Carr, Gas-Works, Widnes.

Tenders to be endorsed "Fire-Clay Goods" or "Scrubber," as the case may be, to be addressed to the Chairman of the Gas Committee, and delivered to the undersigned not later than Noon on the 4th of March.

The Board do not bind themselves to accept the lowest or any tender.

JAS. T. ALLEN, Clerk.
Town Hall, Widnes, Feb. 18, 1889.

IN THE HIGH COURT OF JUSTICE, CHANCERY DIVISION.—MR. JUSTICE NORTH.

In the Matter of Welsbach and Williams, Limited and Reduced,
and
In the Matter of the Companies Act, 1867,
and
In the Matter of the Companies Act, 1877.

NOTICE is hereby given that a Petition presented to Her Majesty's High Court of Justice on the 8th day of February, 1889, for confirming a Resolution reducing the Capital of the above Company from £40,000 to £34,000, is directed to be heard before Mr. Justice Chitty on the 2nd day of March, 1889.

Dated the 19th of February, 1889.

GUSTAVUS THOMPSON AND SON,
Devereux Chambers, Temple, London,
Solicitors for the Company.

CRYSTAL PALACE DISTRICT GAS COMPANY.

NOTICE is hereby given that the ORDINARY HALF-YEARLY GENERAL MEETING of this Company will be held at the Albion Tavern, Aldersgate Street, on Friday, the 15th day of March, 1889, to receive the Report of the Directors; the Balance-Sheet confirmed by the Auditors; to elect two Directors and one Auditor, retiring by rotation; to declare a Dividend; and for General Purposes.

The Chair will be taken at Three o'clock precisely.

By order of the Board,
MAGNUS OHREN, Secretary.
Feb. 22, 1889.

COLNEY HATCH GAS COMPANY.

NOTICE is hereby given that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Company's Offices, New Southgate, on Friday, the 8th of March next, at Six o'clock in the Evening precisely, to receive the Report of the Directors, and the Accounts of the Company for the Half Year ended the 31st of December last; to declare Dividends; to elect Directors; to appoint an Auditor; and for other purposes.

By order,
W. H. HARDY, F.C.A.,
Secretary.
Feb. 16, 1889.

BRIGHTON AND HOVE GENERAL GAS COMPANY.

OFFICES: 5, GREAT WINCHESTER STREET, LONDON, E.C.

TO THE PROPRIETORS.

NOTICE is hereby given that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Company's Offices, No. 5, Great Winchester Street, London, on Friday, March 8, 1889, at Two o'clock in the Afternoon precisely, to receive the Report of the Directors and the Accounts of the Company for the Half Year ending the 31st of December, 1888; to declare Dividends; to elect Directors; to appoint a special Auditor; and for other purposes.

The Transfer Books of the Company will be closed from the 22nd of February to the 8th of March, both days inclusive.

By order,
W. H. HARDY, Secretary.
Feb. 16, 1889.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their Invention may be secured for Twelve months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

Just published, price 7s. 6d.

NOTES ON WATER SUPPLY IN NEW COUNTRIES. With 18 PLATES.

By T. W. STONE, Assoc. M. Inst. C.E.,
Author of "Simple Hydraulic Formulæ."

LONDON: E. AND F. N. SPON, STRAND, W.C.

Plans and Description of the Extensions AT THE *WINDSOR STREET GAS-WORKS OF THE BIRMINGHAM CORPORATION,*

DESIGNED AND CARRIED OUT BY
CHARLES HUNT, M. Inst. C. E.,
Engineer of the Works.

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WALTER KING, 11 Bolt Court, FLEET STREET, E.C.

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Employed in the Manufacture of Gas.

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Third Edition, with 22 Illustrations.

REWRITTEN AND ENLARGED, WITH A CHAPTER ON THE

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By (the late) Mr. R. H. PATTERSON, F.S.S.

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WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

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SANDELL'S GAS COMPANIES' EXPENDITURE JOURNAL.

Being a Ruled Account Book, with Printed Headings and Analyzing Guide, for Keeping (upon the easiest and most correct method) the Expenditure of a Gas Company in accordance with the provisions of the Gas-Works Clauses Act of 1871, and suitable for all Companies.

Prices:

Limp Cloth—Half Quire, 10s.; *One Quire*, 16s.
Half Bound, Cloth Sides—Two Quires, 36s.; *Three Quires*, 44s.

TO BE HAD OF THE PROJECTOR,
EDWARD SANDELL, Chartered Accountant, No. 181, Queen Victoria Street, E.C.
OR OF
WALTER KING, "Journal of Gas Lighting," 11, Bolt Court, Fleet Street, E.C.

FIRE-BRICKS. FIRE-CLAY.

JAMES WHITE & CO.,

Albert Oil-Works,

WIDNES, LANCASHIRE.

Sole Proprietors of the Largest and Purest Beds of Fire-Clay in England.

FOR GAS FURNACES our GANNISTER and SILICA FIRE-BRICKS are acknowledged to be the best and most durable in the market.

GANNISTER and SILICA FIRE-CLAY guaranteed of the Purest and Finest Quality.

ANALYSIS AND REFERENCES ON APPLICATION.

SIXTH YEAR. Now Ready (Demy 8vo., Price 5s., or 5s. 6d. post free),

THE COMPLETE REPORTS OF THE PROCEEDINGS

OF THE VARIOUS

DISTRICT ASSOCIATIONS OF GAS MANAGERS

FOR 1888.

FORMING A COMPANION VOLUME TO THE TRANSACTIONS OF THE GAS INSTITUTE, WITH WHICH IT IS UNIFORM IN SIZE.

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CANNEL COAL MERCHANT
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Prices and Analysis of all the Scotch Cannels on application.

TELESCOPIC EXTENSION LADDERS & STEPS. All sizes, many patterns, large stock for all purposes, indoor and outdoor. Admirable inventions.
HEATHMAN & CO.,
2, Endell St., & 11, High St., Bloomsbury, London, W.C.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
WENLOCK IRON WHARF, 21 & 22, WHARF ROAD,
CITY ROAD, LONDON, N.,
Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1¼ to 48 inches in diameter; and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE. — Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers, and rendering leakage impossible.

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Estimation of (1) Moisture, 1s.; (2) Volatile Matter, 1s. (3) Coke, 1s.; (4) Permanent Gases, 2s. 6d.; (5) Ash, 1s. (6) Ammonia Capacity, 2s.; (7) Carbon, 1s. 6d.; (8) Sulphur, 2s. 6d. 1, 2, and 3 = 2s. 6d.; 1, 3, and 4 = 4s. Complete Combustion, 10s. 6d.
Five Samples submitted at same time to secure above Rate.
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1½ to 12 IN. BORE.

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ALSO MANUFACTURERS OF
SANITARY & RAIN-WATER PIPES, HOT WATER PIPES, STABLE FITTINGS, RANGES, STOVES, And GENERAL CASTINGS.

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FIRE-BRICK AND TILE MERCHANTS,
Wholesale and for Exportation,
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POPE & PEARSON, LTD.,
have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields in practical working over 10,000 cubic feet of gas, with an illuminating power of 16 candles; or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.
One ton yields 12¼ cwt. of good coke.
This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.
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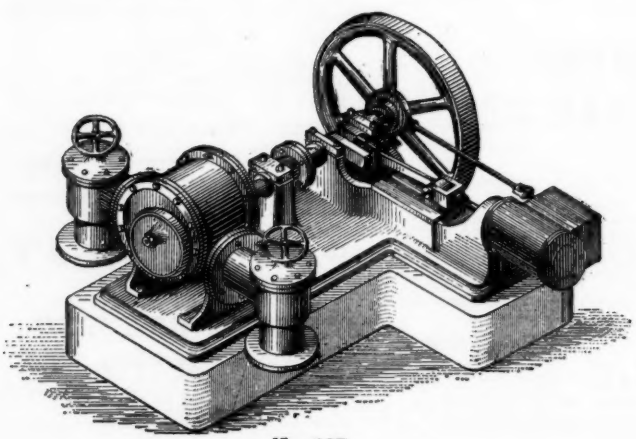
G. WALLER & Co.'s NEW PATENT GAS EXHAUSTER.
MADE WITH FOUR OR THREE BLADES.
In use at, or on order for, over 120 *Works, equal to* 6,840,000 *Cubic Feet per Hour.*
Oldest Makers of Beale Exhausters for over 300 Works and 25,600,000 cubic feet per hour.
1,000 to 250,000 CUBIC FEET PER HOUR WITH OR WITHOUT ENGINE COMBINED.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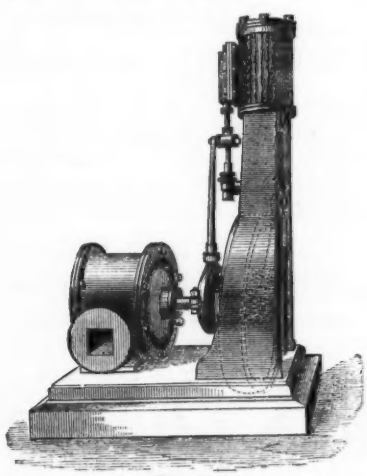
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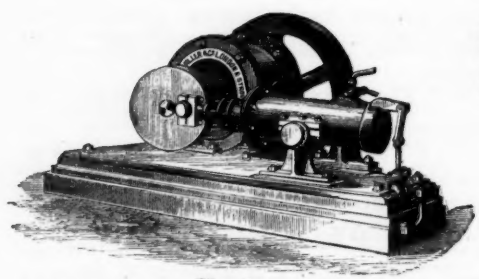
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Disc, Rack, and Screw Valves, Compensating Governors (For Steam Throttle Valves),
Tar, Liquor, and Water Pumps, Hydraulic Main Valves, Coke-Breaking Machines.

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(For Description, see Journal of Gas Lighting, July 17, 1888.)
For the Automatic Determination of the Specific Gravity and the Composition of Gases.
Patented in Great Britain and Abroad.
Sole Agents for the United Kingdom:
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THE
LANEMARK COAL Co., LTD.,
Now offer their superior
GAS COALS
LANEMARK CANNEL.
Yield of Gas per ton . . 10,880 cub. ft.
Illuminating Power . . 29·21 candles.
Coke per ton . . . . 1266·96 lbs.
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Yield of Gas per ton . . 11,379 cub. ft.
Illuminating Power . . 17·88 candles.
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For Prices and Analyses apply to
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THOMAS ILLINGWORTH,
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OF EXTRA QUALITY FOR MAKING
WHITE SULPHATE OF AMMONIA.
TAR, LIQUOR, AND SPENT OXIDE
Purchased for Cash against Delivery.

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Gas Companies are solicited to try Samples of the
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BLACK BED GAS COAL.
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Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for
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BOGHEAD ✣ CANNEL.
Yield of Gas per ton . . . . . 13 155 cub. ft.
Illuminating Power . . . . . 38·22 candles
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Illuminating Power . . . . . 16·3 candles.
Coke . . . . . 70 per cent.
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THE ONLY RELIABLE
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Working One, Two, Three, or Four Purifiers on at the Time.
Also made for Two or Three Purifiers.
No Springing. No Leakage. No Foul Gas passed in Changing. Special Facility for Blowing the Air out of the Fresh Box before putting in Action, without driving it forward into the Holders.
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ALSO DOUBLE-ACTION DOUBLE-FACED GAS & WATER VALVES.
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FOR GAS, WATER, AND STEAM.
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STEEL OF ALL DESCRIPTIONS.
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GAS COAL. BEST **REAL OLD SILKSTONE GAS COAL.**
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THE "NUGENT" RECUPERATIVE RETORT SETTINGS and FURNACES.

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THE ABOVE SETTINGS & FURNACES ARE PROVING EMINENTLY SATISFACTORY.

Every Particular, with Estimates, forwarded upon Application to
MESSRS. J. & H. ROBUS,
CONTRACTORS FOR THE ERECTION OF GAS & WATER WORKS
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THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

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JOHN BROWN & CO., LIMITED,

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This Coal yields 12,600 feet of 19-candle gas per ton.

Weight of illuminating matter in pounds of sperm, 820·80. Very free from impurities.

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Invite attention to the following Specialities:—

PATENT STREET LAMPS,

NO PUTTY OR OTHER MATERIALS ARE REQUIRED TO SECURE THE GLASS. PRICE 9s. 9d. EACH NET.

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Retorts, Mouthpieces, Lamp-Posts, Hydraulic Mains, H-Pipes, Dip-Pipes, Buckstaves, Ash-pans, Sight-Holes, Syphons, Ascension-Pipes, Fire Doors and Frames, Fire-Bars, Hydrants, Valves, Purifiers, Tanks, Columns, &c., &c.

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VALVES OF ALL DESCRIPTIONS AND FOR ALL PURPOSES.

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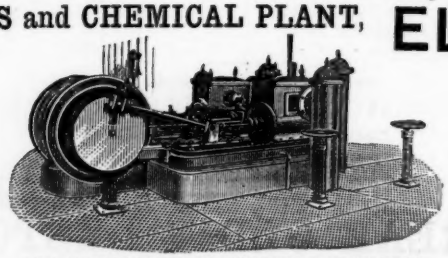

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ALL VALVES TESTED TO 40lbs. AND FLANGES FACED.

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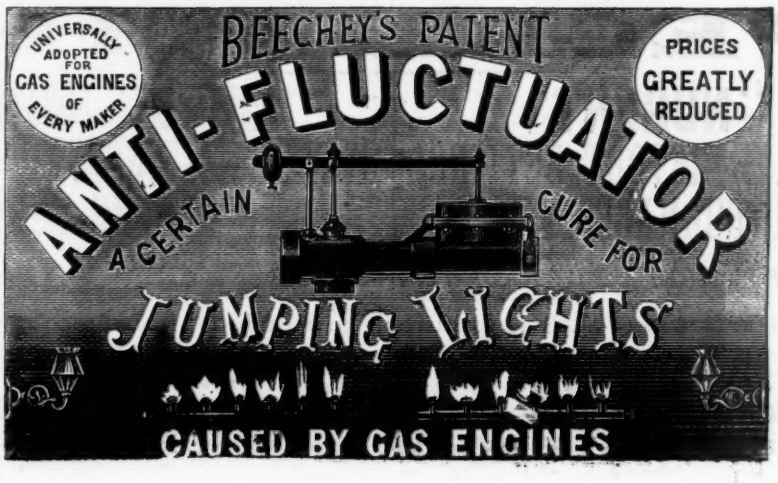

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HISLOP'S PATENT
GAS PRODUCER AND REGENERATIVE SYSTEM OF HEATING RETORTS.

The Patentee's Settings on the Shallow Sunk Chamber Plan,
AND OF FROM
One to Eight Retorts per Oven,

Are at once the most inexpensive and efficacious that can possibly be devised, and are giving absolute satisfaction where in use. By a new an improved means, the Producers of all Settings are now filled directly from the Retorts.

Particulars from the Patentee's Agent for England, J. E. FISHER, Esq., Stourbridge, or from the Patentee,
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HANNA, DONALD, & WILSON,
(ESTABLISHED 1851)
GAS ENGINEERS & CONTRACTORS
FOR THE
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TELESCOPIC AND SINGLE-LIFT GASHOLDERS,
CAST AND WROUGHT IRON GASHOLDER-TANKS,
IMPROVED FIXED OR TRAVELLING HYDRAULIC PURIFIER-COVER LIFTERS,
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TAR AND LIQUOR PUMPS, HYDRAULIC SLUICE AND SLIDE VALVES, LAMP-POSTS AND HYDRANTS COMBINED.

DESIGNS AND ESTIMATES SUPPLIED ON APPLICATION.

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MANUFACTURERS OF EVERY DESCRIPTION OF
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PLANS and SPECIFICATIONS furnished for **Extensions** and **Enlargement** of existing **Works,** adapting them to the most **Improved** and **Modern Principle** of **Gas Manufacture.**

PURIFIERS, CONDENSERS, WASHERS, ENGINES and EXHAUSTERS, STATION METERS and GOVERNORS, manufactured and erected.

Makers, by permission of that eminent authority **Mr. GEORGE LIVESEY,** of his **CELEBRATED PATENT WASHER,** highly approved by all the Engineers of Works where adopted. Largely in demand.

Special reference and attention are invited to our

WET AND DRY METERS,

which have acquired a high reputation for the **excellence** of Materials and Workmanship; their **durability** and **accuracy** of **Register** guaranteed. They are used by several of the **London Gas Companies,** and over **200 Provincial Gas Companies.**

Price Lists, Specifications, and Estimates provided for any work appertaining to Gas Lighting, from the Retort-House to the Drawing-Room.

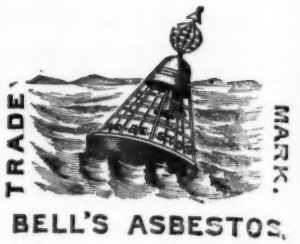
BELL'S ASBESTOLINE.

REGISTERED.

All kegs are labelled as above.

ADVANTAGES OF ASBESTOLINE.

ASBESTOLINE is the most efficient Lubricant for all bearings.
ASBESTOLINE is the cheapest Lubricant.
ASBESTOLINE saves from 50 to 90 per cent. of the Cost of Oil.
ASBESTOLINE is the Cheapest Lubricant.
ASBESTOLINE is favoured by Insurance Companies.
ASBESTOLINE is the most Inodorous Lubricant.
ASBESTOLINE is the safest Lubricant from Ignition.
ASBESTOLINE has beaten all other Lubricants in trials.
ASBESTOLINE is applicable in and out doors in every Climate.
ASBESTOLINE requires no special application.



CONSISTENCY OF ASBESTOLINE.

ASBESTOLINE, to meet all circumstances, is made in four degrees of consistency—A, B, C, and CC.

ASBESTOLINE, A, is specially adapted to ordinary Land Engines and Machinery, in and out door, in this country.

ASBESTOLINE, B, a little more solid, is for use on Steamships in temperate climates, also on land when it is desirable to have Lubricant stiffer than A.

ASBESTOLINE, C, is for use in tropical climates, both ashore and afloat. It is also invaluable in works in this country when the temperature is high.

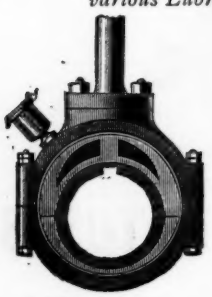
ASBESTOLINE, CC, is designed for use on Calenders, Paper-Machines, &c., where the bearings are heated by steam passing through, and sometimes is advantageously used instead of C.

The reputation of Asbestoline as a Lubricant of the highest efficiency in every kind of Machinery is established; and it has never been equalled by any other Lubricant in the numerous cases of special difficulty in which the best oils are ineffectual. It is used with marked success in Steel and Iron Works, Collieries, Cotton and Wool Mills, and other Textile Manufactories. In Corn-Mills it has proved invaluable on the roller and other modern machines. In Saw-Mills, on machines going up to 5000 revolutions per minute, its work has never been approached by any other Lubricant On Electric Lighting Machinery, and in Steamships of all sizes through out the world, the success of Asbestoline is unequalled. Many engines and machines of all descriptions give trouble, and show bad results both in working and wear, when the system of lubrication has not received due consideration. Engineering firms of the highest standing have given to it their powerful testimony and support.

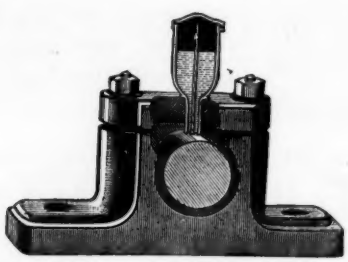
Supplied in Kegs, 28, 56, or 112 lb. Price, 2/3 per lb. Kegs Free. Special Terms for Large Quantities.

IMPORTANT TO EXPORT MERCHANTS.—*One pound of "Asbestoline" equals 2 gallons of Oil weighing 18lbs.; consequently the saving in freight is very considerable. Liberal Terms are conceded to Export Merchants.*

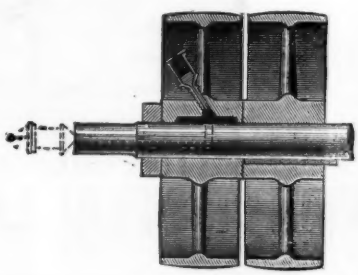
Below will be found illustrations of the mode of fixing Lubricators for Asbestoline to bearings. Full particulars of the various Lubricators supplied for Asbestoline, and the manner of fitting, in catalogue free on application.



Lubricator fitted to Eccentric of Vertical Engine



Showing Section of Lubricator fitted to ordinary Bearings.



Lubricator in different position for Loose Pulleys.

THE ATTENTION OF

ENGINEERS, AND ALL USERS OF STEAM POWER AND MACHINERY,

IS SPECIALLY INVITED TO THE FOLLOWING REPORT.

Owing to the number of Greases now offered, samples of BELL'S ASBESTOLINE were submitted to Otto Hehner, Esq., for analysis, and the subjoined Report fully proves BELL'S ASBESTOLINE to be the safest as well as the best Lubricant for all purposes:—

The Laboratory, 11, *Billiter Square, E.C., London, May* 3, 1888.

I have subjected a sample of Bell's Asbestoline taken from the stores of Messrs. J. Bell and Son, in Southwark Street, to a number of tests, in order to ascertain whether its use in Mills or Factories might contribute to the danger from Fire.

I found that Asbestoline **ignites only with the greatest difficulty** when brought into contact with flame; that wood and other combustible material soaked in Asbestoline burns, if anything, with greater difficulty than by itself; that its **flashing point** is so high that it **lies beyond the range of Mercurial Thermometers;** and that consequently no friction obtainable in the ordinary run of machinery is capable of developing inflammable vapours from it.

Bell's Asbestoline is **as absolutely safe a Lubricant as can be desired or obtainable.** In the case of fire breaking out from any cause, it does not assist the conflagration; and it is **quite incapable of leading to spontaneous combustion,** either by itself or in contact with inflammable material.

From the physical nature of Asbestoline its use is of necessity perfectly clean and free from waste.

(Signed) OTTO HEHNER, Public Analyst.

Illustrated Priced Catalogue, with numerous Testimonials by Leading Firms, free on application.

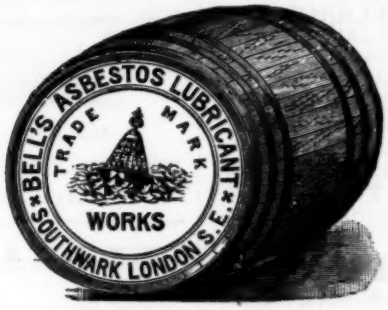
BELL'S ASBESTOS COMPANY, LIMITED,

DEPOTS—MANCHESTER: Victoria Buildings, Deansgate. LIVERPOOL: 2, Strand Street, James Street.

BELL'S ASBESTOS LUBRICANT.

(REGISTERED.)

All Drums marked as above.



Every Cask is sent out as above.

All Corks are sealed as above.

Any Customer receiving Oil sold as Bell's Asbestos Lubricant, and Cask, Drum or Corks not marked as above, is earnestly requested to forward us sample and particulars of where obtained.

The following Oils, refined and prepared by our Asbestos process, are specially recommended to Users of Machinery of every kind in all parts of the world. We guarantee the quality of each to be unequalled at the price for the purpose named, and a Sample Drum, containing 5 gallons of each or any sort, will be sent on approval to any respectable firm in any part of the world :—

BELL'S SPECIAL GAS-ENGINE OIL.—This oil is guaranteed to stand flame temperature, and is suitable for light Machinery and Shafting where gas power is used.
Price **2s. 9d.** per gallon.

1a.—BELL'S SPECIALLY PURIFIED DARK CYLINDER AND VALVE OIL.—This oil is guaranteed not to gum, corrode, or in any way injure metal surfaces. It will not carbonize, nor leave any deposit whatever in cylinders or condensers, nor will it injure india-rubber valves. It is absolutely pure hydrocarbon, and will work admirably in all good Sight-feed Lubricators.
Price **3s. 9d.** per gallon.

2a.—Bell's Specially Refined and Purified Pale Cylinder and Valve Oil contains the same properties as 1a, and is one of the very best Oils of the Valvoline class in the market.
Price **4s. 6d.** per gallon.

BELL'S PALE COMPOUND MACHINERY AND ENGINE OIL FOR EXTERNAL LUBRICATION ONLY.

"3c."—For small and medium-sized Engines, Shafting, and quick-running Machinery, displacing Lard Oil. Price **2s. 6d.** per gallon.

"3c. Special."—Heavier bodied than "3c.," and suitable for Locos. and Stationary Engines up to 300-H.P., displacing Olive Oil.
Price **2s. 9d.** per gallon.

"3c. Marine."—Much heavier than "3c.;" suitable for Marine Engines and heaviest Stationary Engines, Shafting, &c., displacing Castor Oil. Price **3s.** per gallon.

BELL'S AGRICULTURAL MACHINE OIL, for Traction Engines, Road Rollers, and all Machines working out of doors. This Oil will not set on bright parts, is not affected by extreme cold or the rays of the sun. Price **2s. 9d.** per gallon.

For other Qualities and Prices, with Testimonials, see Catalogue, free on application.

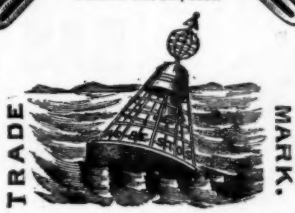
BELL'S ASBESTOS

EXPANSION SHEETING.

Section of Sheeting.
Patent No. 640, 1884.

The above, which can only be obtained from this house, is recognized as the Most Efficient and Economical Jointing Material in use. It is composed of a specially prepared India-rubber Compound, protected by a covering of Vulcanized Asbestos Sheeting, as shown above, and as it is the only Jointing Material which adequately combines PERMANENT ELASTICITY WITH HEAT RESISTANCE, the advantage it possesses will at once be seen.

EXPANSION RINGS.



The centre from which the requisite elasticity is obtained will adapt itself to uneven surfaces to which it may be applied, and allow expansion and contraction to be fully taken up. The covering, being of Asbestos Cloth, imparts a protection to the centre, and so prolongs its elasticity. For Manhole, Mudhole, Steam-Pipe, and Mash-Tun Door Joints it is unequalled; and if applied as directed, a ring can be used many times over.

BELL'S ASBESTOS.

Price **6s.** per lb. in Sheets. Rings made up to Template, **9s.** per lb.

Made from 1-Ply for Cylinder and Faced Joints to any thickness for Uneven Surfaces.

Illustrated Priced Catalogues, with numerous Testimonials from Leading Firms, free on application.

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CARDIFF: West Bute St. BIRMINGHAM: 7, John Bright St. HULL: Humber Dock Basin. GLASGOW: 35, Robertson St.

"THE METEOR."

NEW HIGH-POWER GAS-LAMP, WESTPHAL'S PATENT.
MOST INTENSE WHITE BRILLIANT GAS LIGHT.
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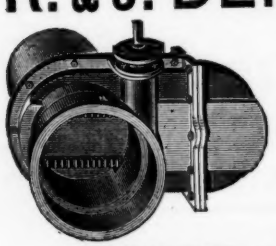

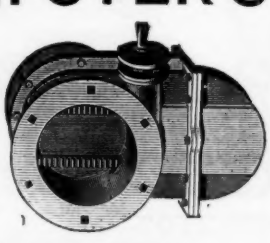

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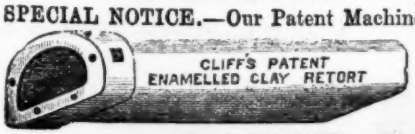

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From Peter W. Barlow, Esq., F.R.S., F.G.S.
Engineer to the Tower Subway Co.

56, *Landsdowne Road*, W.,
Feb. 21, 1888.

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I am, yours truly,
PETER W. BARLOW.

Cork Gas Consumers' Company,
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Telegraphic Address: "INDEX, LONDON."

[See also Advt., p. 376.

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